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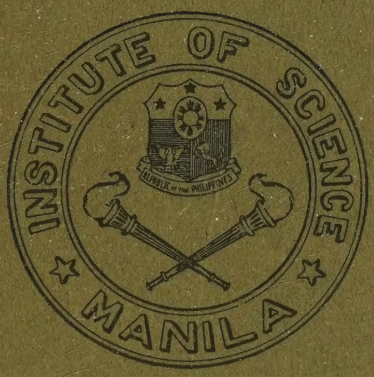

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MARCOS A. TUBANGUI: IN MEMORIAM *

On October 26, 1949, Dr. Marcos A. Tubangui, our foremost Filipino parasitologist of international renown, passed to the Great Beyond after a short illness. His passing is a great loss, not only to the Philippines, but also to the whole science of parasitology; it left a void which will be difficult to fill for many years to come.

Dr. Marcos A. Tubangui was born in Porak, Pampanga, on April 25, 1893. He studied in the public schools and graduated from the College of Veterinary Science, University of the Philippines, in 1918. After graduation, he served as veterinarian in the Bureau of Agriculture for a year, and then was sent abroad as fellow of the University of the Philippines.

While in the United States, he attended the Marine Biological Laboratory at Woods Hole, Massachussetts; the University of Illinois; and worked at the Bureau of Animal Industry, U. S. Department of Agriculture. In 1921, he received his Master of Science degree at Cornell University.

Upon his return to the Philippines in that year, he was made instructor and, later, assistant professor of veterinary parasitology, University of the Philippines. In 1931, he transferred to the Bureau of Science and spent the best years of his life as Chief of the Division of Biological Research. In 1948 he was appointed Professor and Head of the Department of Parasitology, Institute of Hygiene, University of the Philippines, a position which he held until his death.

* By Dr. T. P. Pesigan, senior parasitologist and chief, Schistosomiasis Control Program, Department of Health, Republic of the Philippines.

Dr. Tubangui was an active member of many learned societies and professional organizations. He was a member of Sigma Xi, the American Association for the Advancement of Science, the American Society of Parasitologists, the Society for the Advancement of Research, Los Baños College, of which he was once Secretary, the Philippine Scientific Society, the Philippine Veterinary Medical Association, the Philippine Medical Association (associate member), the National Research Council of the Philippines (Charter Member), and the Philippine Society of Parasitology, of which he was President for many years until his death.

He contributed a great deal to the science of parasitology, particularly taxonomy of many helminths. He wrote and published many scientific papers on both medical and veterinary parasitology. Most outstanding of his contributions to medical parasitology are the complete life cycle of *Euparyphium ilocanum* which he worked out, and his discovery of the molluscan intermediary host of the *Schistosoma japonicum* in the Philippines. With these investigations, he paved the way towards the control of these parasitic diseases in this country. He also left several unfinished works, especially on paragonimiasis and filariasis, which even a few days before his death, he repeatedly told his wife he would wish to continue, still hoping he would get well.

The career of Dr. Tubangui is a great inspiration to the young researchers of the Philippines; for as a leader in his field, he was always helpful and kind to his younger associates. They, in turn, loved and respected him. Above all, he was always a silent and devoted worker. He sustained his enthusiasm for research until his death, despite difficulties. His deep understanding of human nature and his undying interest in his work always kept him away from controversies. He died a true scientist in the strict sense of the word.

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MARCOS A. TUBANGUI

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HUMAN MILK STUDIES: I. THE THIAMINE CONTENT OF MATURE NORMAL MILK AND BERIBERI MILK[1]

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The study of thiamine content of breast milk is important in this country since it is the only natural source of thiamine available to breast fed babies. Moreover, it has been found in the past that the death rate among the breast fed infants was higher than that of artificially fed babies. This was due to the fact that infantile beriberi was mostly found among the breast fed infants.

Vedder and Clark(1) have found that 5 cc of fresh cow's milk did not prevent polyneuritis in birds on a polished rice diet. Gibson(2) in studying the protective power of normal breast milk of Filipinos against polyneuritis gallinarum has found that it contained not more than one-fourth the amount of vitamin of cow's milk. Again Gibson and Concepcion(3) in studying the influence of fresh and autoclaved milk on the development of neuritis in animals have demonstrated that 20 cc of fresh human milk of Filipino mothers did not prevent birds on a polished rice diet from developing polyneuritis. The observation of Clements(4) that breast fed infants frequently exhibit partial thiamine deficiency is of interest in this connection. He also noted that partial thiamine deficiency was frequently found among the breast fed infants in Australia and attributed it to suboptimal quantities of thiamine in the milk, resulting from insufficient intake. On the other hand, Sundarajan(5) found that the average thiamine content of milk among women with beriberi in India was not less than the values found among normal women. In view of this contradictory findings the determination of thiamine content of normal as well as beriberi milk is of special interest in this country in

[1] Aided by special grant from the Institute of Nutrition.

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order to establish the relationship, if there is any, between low thiamine and infantile beriberi.

METHOD OF STUDY

The present study is a report on the thiamine determination made on 140 samples of mature milk taken from both breasts of healthy mothers eating self-chosen diets and 21 samples of beriberic milk from others whose babies showed characteristic symptoms of infantile beriberi. The samples were taken between 9 and 10 a.m. and in different stages of lactation. The total thiamine was determined by the method described by Kendall(6) with a slight modification and can be described as follows:

Five ml. of milk is placed in each one of the four reaction vessels and then 0.25 ml. of 10 per cent freshly prepared takadiastaseis added. Then 0.25 ml. of 10 per cent acetic acid is added. Incubate for 3 hours at 37°C. At the end of the period remove the reaction vessels and add 1 ml. of thiamine standard solution to the reaction vessel No. 3. Then add 3 ml. of the oxidizing reagent (0.1 ml. of 1 per cent $K_3Fe(Cn)_6$ in 3 ml. of 15 per cent NaOH) to each of the vessels Nos. 1, 2 and 3. To vessel No. 4 add 3 ml. of 15 per cent NaOH. Shake the vessels from end to end gently for 45 seconds then add to each vessel 13 ml. of redistilled isobutanol. Shake again gently for exactly 1½ minutes. Centrifuge for 5 minutes, draw off the aqueous layer. Pour the isobutyl layer into the cuvettes and read after adjusting the reading of the fluorophotometer with the quinine standard.

The calculation is made as follows: The average reading of reaction vessels Nos. 1 and 2 less the reading of the blank ($R.V._4$) divided by the reading of the reaction vessel No. 3 minus the average readings of reaction vessels Nos. 1 and 2 times 20 equals micrograms of thiamine per 100 cc milk.

RESULTS

The results of the present investigation are summarized in Tables 1, 2, 3 and 4.

As shown in Table 1 the mean of 140 samples of normal milk is 7.691 mcg.± 0.322 with a standard deviation of 3.820. On the other hand, the mean of 21 cases of beriberic milk as shown in Table 2 is 4.97 ± 0.677 with a standard deviation of 3.0277.

TABLE 1.—*Total thiamine content of normal milk.*

Age of milk	No. of samples	Mean thiamine	S. D.	S. E. M.
		mcg		
1 month	15	7.995	3.944	1.054
2 months	21	5.438	3.122	0.698
3 months	22	9.31	4.256	0.9286
4 months	14	6.99	3.494	0.969
5 months	19	8.813	4.092	0.964
6 months	14	9.22	5.775	1.602
7 months	8	6.218	3.955	1.722
8 months	11	7.957	2.851	0.902
9 months	4	5.335	3.007	1.736
10 months	1	12.03		
11 months	4	6.337	0.948	0.548
12 months	7	6.79	4.489	1.837
	140	7.691	3.820	0.322

TABLE 2.—*Total thiamine content of beriberic milk.*

Age of milk	No. of samples	Mean thiamine	S. D.	S. E. M.
		mcg		
1 month	7	4.34	3.935	1.607
2 months	4	4.03	2.607	1.558
3 months	2	6.25	3.35	3.35
4 months	5	5.912	2.736	1.368
5 months	3	5.24	1.087	0.769
	21	4.97	3.0277	0.677

TABLE 3.—*Total thiamine content of normal milk during the first five months.*

Age of milk	No. of samples	Mean thiamine	S. D.	S. E. M.
		mcg		
1 month	15	7.9954	3.944	1.054
2 months	21	5.4380	3.122	0.698
3 months	22	9.3100	4.256	0.9286
4 months	14	6.9900	3.494	0.969
5 months	19	8.8130	4.092	0.964
	91	7.740	3.984	0.420

TABLE 4.—*Thiamine content of human milk as reported by various authors.*

Investigator	Method	Subjects	Samples	Period of lactation	Total thiamine
					mcg per 100 cc
Kendall	Thiochrome	63		2-10 da.	0.0-9.0
Slater and Rial	Thiochrome	29-31	80-61	3-38 wk.	12.7
Roderuck et al	Thiochrome	65	90	2-10 mo.	14.8
This series	Thiochrome	140	140	1-12 mo.	7.6

Since the beriberi cases were only found between the ages one and five months, we cannot very well compare them with the normal because their ages range from one to twelve months. The logical comparison is to compare the beriberi cases with the normals from one to five months also. This is summarized in Table 3. The difference in the mean between the normal and beriberic milk, as shown in Tables 2 and 3, is 2.77. This difference when studied statistically was found to be significant. The value of t being 3.48 which is significant even at 1 per cent level.

COMMENT

According to Slater and Rial(7) the average total thiamine content of milk from 3 to 38 weeks is 12.7 mcg. per 100 cc. as shown in Table 4. Roderuck *et al.*(8) found an average of 14.8 mcg. per 100 cc. from 2 to 10 months. Knott's group(9) found an average of 15.1 mcg. per 100 ml. for mature milk. All these findings were higher than the result of the present investigation. This can only be explained by the difference in the thiamine content of the diet. This explanation is supported by the high incidence of beriberi in this country. According to Roderuck *et al,* diet showed a clean cut relationship to the thiamine content in human milk.

The average concentration of thiamine in milk remained relatively constant after the fourth week of lactation according to Roderuck *et al.* Knott reported that the thiamine in milk reached the level characteristic of the subject in three weeks. On the other hand, Slater and Rial found a gradual increase in the thiamine content until the twentieth week. Our results cannot corroborate or disprove those findings because our samples were not 24-hour samples.

Knott(9) reported some determination of thiamine content of breast milk from 17 women where figures range from 3–18 mcg. per 100 cc. with an average of 9 mcg. She attributed this low thiamine content of human milk to the low content of thiamine in the diet since food is an important factor influencing the thiamine content of breast milk. The question of whether breast milk is adequate in meeting the thiamine requirements of infants has been answered by Knott *et al* when they stated that the minimum thiamine requirement of young infants (1 to 6 months of age) is approximately 200 mcg. daily. This amount can just be met by a normal healthy infant if his mother's milk contains 20 or more mcg. of thiamine per 100 cc. They suggested that 40 mcg. per kilogram body weight may be necessary to supply the needs of the infant. This finding was corroborated by Holt *et al,*(10).

SUMMARY

1. One hundred forty samples of mature human milk from normal women taking ordinary diet have been assayed for total thiamine and a value of 7.691 mcg. ± 0.322 per 100 ml. with a standard deviation of ± 3.820 was found.

2. Twenty one samples of mature human milk from mothers whose babies showed clinical symptoms of infantile beriberi have been assayed for total thiamine and a mean value of 4.97 ∓ 0.677 per 100 ml. milk with a standard deviation of ∓ 3.0277 was found. The difference in the mean between normal and beriberic milk was found to be statistically significant. The value of t being 3.48 which is significant even at 1 per cent level.

3. The determination of thiamine content of milk may be of some help in the diagnosis of beriberi when the clinical symptoms of the disease are not quite conclusive.

4. Because of the limited number of samples of beriberi milk examined, it is rather risky to give a definite conclusion whether the mean figures given here are of some practical value in the diagnosis of beriberi or not even though the difference between the two means is statistically significant.

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OBSERVATIONS ON THE PREVALENCE OF TABANID FLIES AND SURRA-TRANSMISSION EXPERIMENTS

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ONE PLATE AND ONE TEXT FIGURE

Of the known vectors of surra, the horseflies are considered the most dangerous. It has been estimated that there are about 2,000 known species of horseflies in the world. Patton and Cragg (1913) recorded 106 Oriental species belonging to the genus *Tabanus*, two of which are known to exist in the Islands (*Tabanus vanderwulpi* and *Tabanus striatus*). Schuurman Stockhoven, Jr. (1926) recorded 239 species in the Dutch East Indian Archipelago and neighboring countries in the Far East, of which four occur in the Philippines, namely, *Tabanus striatus, Tabanus reducens, Tabanus flexilis* and *Tabanus factiosus.* Perhaps the most comprehensive systematic study of the genus *Tabanus* in the Islands is that of Kroeber (1924) who listed 13 species, among which are the following: *Tabanus ixion, Tabanus univentris, Tabanus flaviventris, Tabanus rubidus, Tabanus fumifer, Tabanus malayensis, Tabanus philippinensis, Tabanus malanopygatus* and *Tabanus graiseoscutellatus.* All told, fourteen species of *Tabanus* have been described from the Philippines, of which *T. striatus* and *T. reducens* appear to be the most common (Pl. 1, figs. 1 and 2).

INCIDENCE OF TABANUS STRIATUS AND TABANUS REDUCENS

The study on the occurrence of horseflies was conducted on the grounds of the Bureau of Animal Industry, and also on a lot formerly occupied by the College of Veterinary Medicine in Pandacan, Manila. The marshy land and the zacate field in the immediate vicinity were also included in the survey. Most of the flies collected were caught from the telegraph and electric posts on the sides of the abandoned railway tract crossing the area. A random examination of the soil in this area revealed the presence of larvæ of horseflies, suggesting that it is a breeding place of tabanid flies. Previous observations have shown that the flies usually rest on the posts during

the middle of the day. For this reason, the collection of flies was made between 12:00 and 1:00 o'clock in the afternoon. The work was started during the Japanese occupation but since some of the data pertaining to that period were lost, only those collected after liberation are included in this paper.

During a period of three years and two months (November, 1945 to December, 1948), 854 tabanids were caught, of which 480 were *Tabanus striatus* and 374 *Tabanus reducens,* the former exceeding the latter by 106 flies. Of the 480 *Tabanus striatus* 57 were males, the male—female ratio being thus 1:7.42. In the case of *Tabanus reducens,* 14 were males and 360 females, the male—female ratio being 1:25.71. It will be noted that there were more than 4 times more males of *Tabanus striatus* than *Tabanus reducens* and this may account partly for the greater number of *Tabanus striatus* collected during the period under consideration.

While the female flies were seen throughout the year, the males were absent during certain months. In the case of *Tabanus striatus,* males were not found during June and July; the maximum catch of 15 male flies was made during the month of February and the minimum catch of one fly, during May. In the case of *Tabanus reducens,* three males were collected during each of the months of January, October, November, two in December and one each in February, March and May. None were found during April, June, July, August and September.

THE INFLUENCE OF RAINFALL ON THE MONTHLY DENSITY OF TABANID FLIES

Of the factors which may be responsible for the monthly fluctuation in the prevalence of tabanid flies, only the rainfall seems to have an appreciable influence. A summary of the fly collections during the three year period and the corresponding rainfall data are presented in Figure 1 and Table 1. Although tabanid flies were always found during the three-year period, it is shown they were more abundant during certain months. A subpeak representing 37 flies was observed in February and this was followed by a gradual decline up to June, when the smallest collection of 4 flies was recorded. Thereafter, the monthly average catch increased up to October when the maximum collection of 72.6 flies was made. After this month, the fly-densities decreased up to the end of the year. In general, the data agree with those of Mitzmain (1913) who found *Tabanus striatus* to be prevalent from October to March in the

vicinity of Manila. On the other hand, Kelser (1927) observed that during 1926 *Tabanus striatus* commenced to make its appearance in and around Manila in appreciable number during the later part of July and that by the middle of August great numbers of flies were in evidence. Manreza and Mondoñedo (1935), working in Los Baños, Laguna, also recorded a monthly fluc-

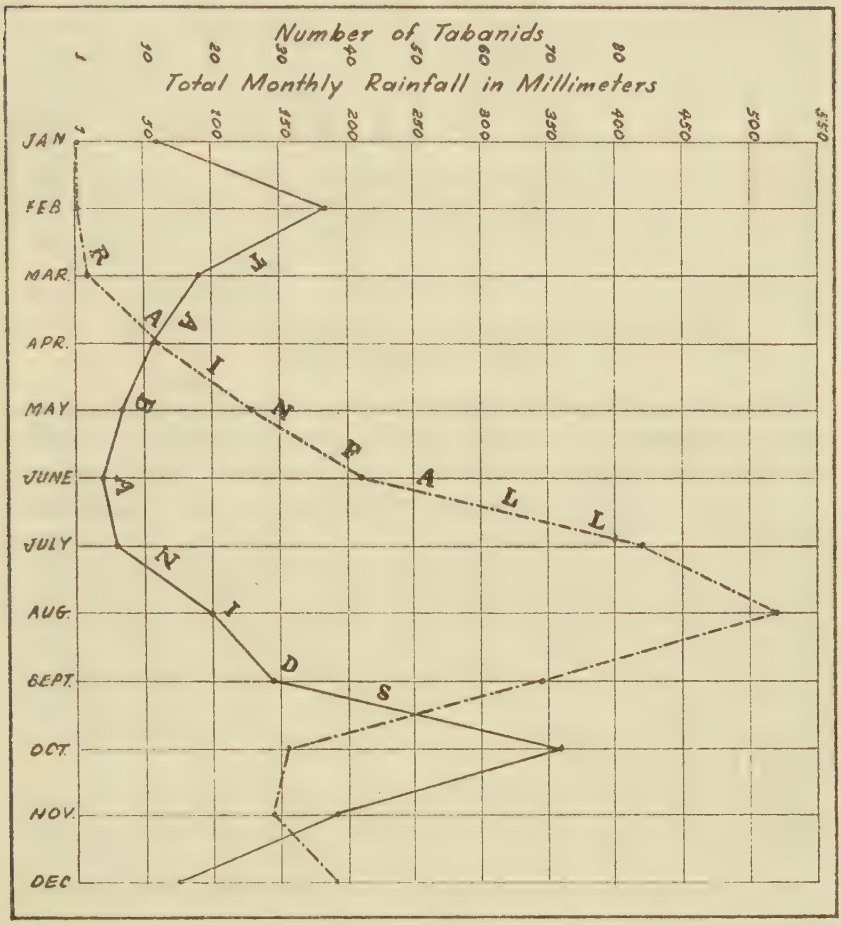

Fig. 1. Influence of rainfall on the numerical fluctuation of tabanid flies.

tuation in the density of *Tabanus striatus*. They made their maximum collection in May, the minimum in October. It thus appears that the monthly prevalence of horseflies varies considerably in different localities and possibly during different years. Correlating the monthly collections with the seasonal distribution of the annual rainfall, as shown in Figure 1, it is seen that

the peak of fly incidence in October occurs two months after the heaviest rainfall in August. In British East Africa Leese (1914) observed that species of *Tabanus* are abundant during and after the rainy season, the numbers falling off greatly as the dry season advances.

TABLE 1.—*Data on rainfall and its relation to tabanid incidence*

Months	Average for three-year period		Months	Average for three-year period	
	Tabanids	Rainfall in mm.		Tabanids	Rainfall in mm.
January	12.3	2.6	July	6.6	418.2
February	37.0	2.6	August	20.6	523.7
March	18.6	10.7	September	29.3	347.2
April	11.3	63.6	October	72.6	157.9
May	7.3	127.1	November	38.0	145.3
June	4.0	212.9	December	15.2	186.8

TABANUS REDUCENS AND TABANUS STRIATUS IN SURRA TRANSMISSION

Since no records are available that *Tabanus reducens* has been found guilty as a vector of *Trypanosoma evansi*, it seemed desirable to test this horsefly in the laboratory. For comparative purpose, *Tabanus striatus* was also used in the transmission experiments. Guinea pigs and white rats kept in a fly-screened enclosure were utilized. The horseflies used were selected from those collected during the survey. It may be noted here that only a small percentage of the flies could be induced to bite under experimental conditions and could not be kept alive in the laboratory for long periods of time. In one instance, however, a *Tabanus reducens* was maintained in captivity for a period of one month.

The feeding of flies was carried on in small wire baskets applied on surra-infected guinea pigs where the hair had been previously clipped close to the skin. As a rule, the flies were allowed to feed for from 30 seconds to one minute, after which they were transferred to a clean white rat where the hair had also been previously shaved. The intervals between feedings ranged from 20 seconds to one and one-half minutes. In some of the flies four to five interrupted feedings could be carried on before they refused to bite any further.

For convenience, the results are summarized in Table 2. Of four experiments with *Tabanus reducens*, three were positive. With *Tabanus striatus*, only one positive result was recorded

out of the four trials and it was due to the use of eight flies in 32 interrupted feedings. Mitzmain (1914) had practically the same experience with *T. striatus,* for in his experiments he obtained only three positive results out of 16 trials. It thus appears that *Tabanus reducens* is a more efficient transmitting agent of the surra parasite than *Tabanus striatus.* Since the method of transmission is purely mechanical, it is most probably the larger size of the fly and its mouth parts which make it a more dangerous vector. Measurements made from a number of specimens show that *Tabanus reducens* is approximately one-third longer and broader than *Tabanus striatus* and its mouth parts are correspondingly bigger.

TABLE 2.—*Data on the mechanical transmission of surra by T. reducens and T. striatus*

Expt. No.	Density of trypanosome in peripheral blood of surra infected guinea pig per cu. mm.	Species and number of fly used	No. of bite	Clean animal used	Results
1	250,000	*T. reducens* 2	5	White rat	+
2	150,000	do 1	4	do	—
3	200,000	do 2	6	do	+
4	80,000	do 2	6	do	+
5	300,000	*T. striatus* 3	10	do	—
6	120,000	do 2	5	do	—
7	160,000	do 8	32	do	+
8	100,000	do 2	5	do	—

With *T. reducens* there are at least 22 species of tabanid flies which have been proven experimentally to transmit *Trypanosoma evansi.* The others, according to the investigations of Sergent, Ed. and Et. (1905 b and 1906 a), Fraser and Symonds (1908), Mitzmain (1912), Kelser (1927), Cross and Patel (1922), and Nieschulz (1926, 1927, 1929, and 1941), are: *T. albimidus, T. albitriangularis, T. bilateralis, T. brunipes, T. ceylonicus, T. fumifer, T. griseipalpis, T. hilaris, T. immanis, T. latifacies, T. malayensis, T. minimus, T. nemocallosus, T. nemoralis, T. partitus, T. rubidus, T. rufiventris, T. striatus, T. vagus, T. vanecki, and T. tropicus.*

SUMMARY

Observations on the monthly prevalence of tabanid flies were made. During a period of a little over 3 years, 854 flies were caught, of which 480 were *Tabanus striatus* and 374 *Tabanus reducens.* The male—female ratio of the former is 1:7.42, the latter, 1:25.71. A large number of males were collected during February and March. The peak of fly-incidence occurred in

October or two months after the heaviest rainfall in August. A subpeak was noted in February following an increase in the rainfall during December.

Positive results were obtained in experiments on surra transmission using *Tabanus reducens* and *Tabanus striatus*. *Tabanus reducens* appeared to be a more efficient vector than *T. striatus*, due probably to its bigger size.

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ILLUSTRATIONS

PLATE 1

FIG. 1. Female and male *Tabanus reducens.*
2. Female and male *Tabanus striatus.*

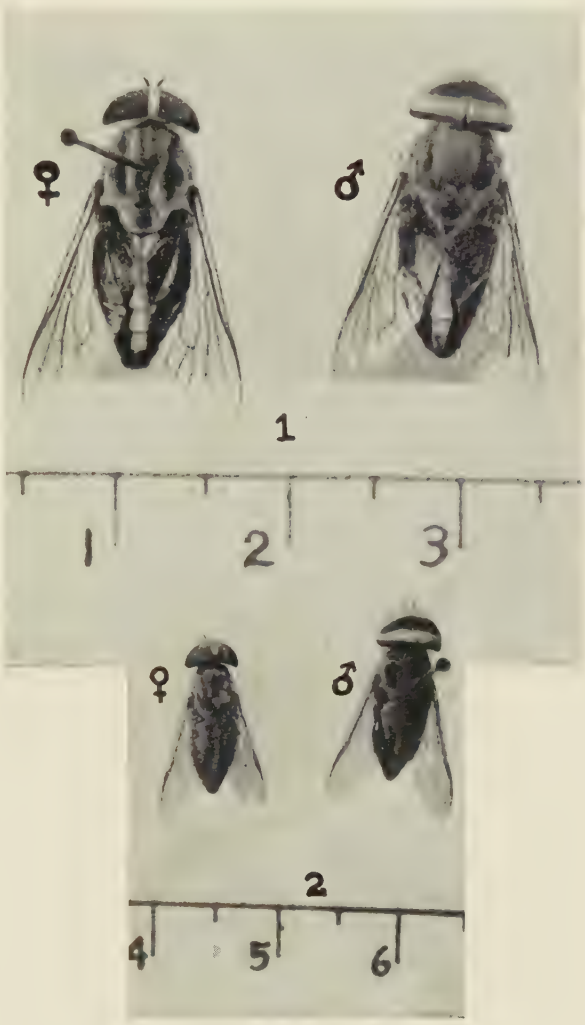

PLATE 1.

ASPIDIACEAE OF NEW GUINEA *

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Of the University of California, Berkeley

FORTY-FOUR PLATES

This paper includes material based on work mostly performed from 1939 to 1941, and included in several papers originally submitted for publication in The Philippine Journal of Science. It is recast here, in conformity with classification and nomenclature of my Genera Filicum. When war made the publication of these papers impossible, even after proof had been corrected, and the fate of my manuscripts unknown (all are known now to have been destroyed), I guarded the names of the many novelties by publication of diagnoses in Univ. Calif. Publ. Bot. **18** (1942) 217–226. The descriptions and illustrations, necessary to make these novelties certainly and easily recognizable, appear here for the first time.

Key to Genera of New Guinea Aspidiaceae

Fronds dimorphic.
  Veins free.
    Not widely scandent, fronds simple ..... 14. *Elaphoglossum*
    Rhizome scandent, fronds compound.
      Sori distinct ..... 10. *Thysanosoria*
      Sporangia covering fertile surface.
        Terminal leaflet not articulate ..... 9. *Lomariopsis*
        Distal leaflet jointed or suppressed.
          Leaves in two rows on rhizome..... 11. *Teratophyllum*
          Stipes polyseriate ..... 12. *Arthrobotrya*
  Veins anastomosing.
    Without included veinlets.
      Widely scandent ..... 13. *Lomagramma*
      Not scandent.
        Rhizome short, fronds clustered ..... 20. *Stenosemia*
        Rhizome creeping, fronds remote ..... 8. *Bolbitis*
    Included veinlets present.
      Rhizome short, fronds clustered ..... 22. *Hemigramma*
      Rhizome creeping ..... 8. *Bolbitis*

* This paper is in part a report on the ferns collected by the third Archbold Expedition to New Guinea, in collaboration with the Government of the Netherlands Indies. Previous reports were published in the Philip. Jour. Sci. **73** (1940) 345 and 457; **75** (1941) 347; and **76** (1941) 23; and Univ. Calif. Publ. Bot. **18** (1942) 217.

Fronds not dimorphic or slightly so.
  Veins free.
    Indusium wanting.
      Sori round ..... 23. *Lastrea*
      Sori elongate ..... 24. *Currania*
    Indusium elongate along vein.
      Pinnules articulate, subdimidiate ..... 6. *Didymochlaena*
    Indusium ovate, free at apex ..... 2. *Stenolepia*
    Indusium round, bursting on top ..... 1. *Diacalpe*
    Indusium peltate.
      Pinnae articulate to rachis ..... 5. *Cyclopeltis*
      Pinnae not articulate.
        Articulate hairs wanting.
          Frond dilated at base ..... 7. *Rumohra*
          Frond not widened at base ..... 4. *Polystichum*
        Articulate hairs on rachis ..... 17. *Dryopolystichum*
    Indusium reniform.
      Nodes of rachis enlarged ..... 3. *Acrophorus*
      Nodes not enlarged.
        Axes bearing pluricellular hairs ..... 16. *Ctenitis*
        Glabrous, or hairs unicellular.
          Each sinus occupied by a tooth ..... 18. *Pteridrys*
          Sinuses not tooth-bearing.
            Minor axes decurrent on major..... 15. *Dryopteris*
            Minor axes not decurrent.
              Frond anadromic, base broad..... 7. *Rumohra*
              Frond catadromic ..... 23. *Lastrea*
Fronds anastomosing in regular pairs.
  Frond not proliferous.
    Rachis not spiny.
      Indusium roundish, fixed by sinus..... 25. *Cyclosorus*
      Indusium oblong, fixed along middle..... 27. *Sphaerostephanos*
    Rachis spiny, sori linear ..... 30. *Callipteris*
  Frond proliferous ..... 26. *Ampelopteris*
  Veins anastomosing irregularly.
    Areolae costular only, costal sori elongate..... 19. *Heterogonium*
    Areolae not all costular, or sori round.
      Free included veinlets present ..... 21. *Tectaria*
      Free included veinlets wanting.
        Indusium opening along margin..... 28. *Athyrium*
        Indusium bursting on top ..... 29. *Diplaziopsis*

1. DIACALPE Blume

D. ASPIDIOIDES Blume

D. aspidioides Blume, Enum. (1828) 241.

Carr. 14567, Boridi, alt. 1,800 m; *Brass 4115,* Mt. Tafa, alt. 2,300 m.

To India and China.

2. STENOLAPIA Van Alderwerelt Van Rosenburgh

S. TRISTIS (Blume) v.A.v.R.

S. tristis (Blume) v.A.v.R., Bull. Dépt. Agric. Ind. Néerl. No. 27 (1909) 46, *Pl. 7.*
var. *papuana* C. Chr., Brittonia 2 (1937) 294.
var. *reducta* C. Chr., ibid.

Brass 4234, 4329, 4482, Mt. Albert Edward, alt. 3,680 m; *Clemens,* Mt. Sarawaket.

The species is known elsewhere to be very plastic under the influence of exposure, and var. *reducta* is a stunted form.

The species in Java and Borneo.

3. ACROPHORUS Presl

A. STIPELLATUS (Wallich) Moore

A. stipellatus (Wallich) Moore, Gard. Chron. (1854) 135.
A. stipellatus var. *montana* Ros., Fedde's Repert. **12** (1913) 166.
A. Blumei Ching, Gardens' Bull. **7** (1934) 226.

Brass 10716, Lake Habbema, alt. 2,800 m; *12219,* alt. 1,750 m; *Keysser II 73, II 76* (isotype of var. *montana*), Bolan, alt. 2,400–3,000 m.

Paying some regard to geographic distribution, and judging by specimens I have seen, alive and in herbaria, I feel constrained to construe *Acrophorus* as a genus of one known variable species. It varies in size, and therewith it may be three times or four times pinnate. It varies in size of pinnules, in prickliness, chaffiness and hairiness of the axes, and in size of indusia. But there is not an Indian species characterized by one set of characters, nor a Javan species with another set, which might be the *A. stipellatus* and *A. Blumei* of Ching and Christensen. *Wallich 359,* from Nepal, is fully quadripinnate, with very small ultimate pinnules; its axes are very nearly smooth, and the indusia small; but specimens like it in the four characters mentioned are in hand from Sumatra and Fiji. Borneo and Luzon specimens are most scaly, and this strain extends to Formosa. Judging by material in hand, the species runs small in China, and very large in Fiji.

ACROPHORUS LOXOSCAPHOIDES (Baker) Alston

Acrophorus loxoscaphoides (Baker) Alston, Jour. of Bot. (1939) 288.
Polypodium loxoscaphoides Baker, Jour. of Bot. **28** (1890) 107.
Dryopteris loxoscaphoides C. Chr., Index (1905) 276.
Leucostegia loxoscaphoides C. Chr., Suppl. III (1934) 120.

"The type is an exceedingly poor specimen, but this appears to be the correct disposition of it,"—Alston, l. c. I have no other opinion, but would emphasize the word *appears*. The type was collected by MacGregor, "Mount Musgrave and 9,200 ft. on Owen Stanley range."

Dryopteris subdigitata Brause, Engler's Jahrb. **56** (1920) 94, was also treated as *Leucostegia* by Christensen, Suppl. III 98 and 121, with the suggestion that it, and *Davallia Forbesii* Gepp, Journal of Bot. (1923) Suppl. 59, might both be *Leucostegia loxoscaphoides*.

4. POLYSTICHUM Roth

Key to the species

Frond over half as broad as long ..... 1. *P. keysserianum*
Frond over twice as long as broad.
  Pinnules or segments not strongly bullate.
    Lamina at least 30 cm long.
      Freely tripinnate ..... 2. *P. bamlerianum*
      Only lowest pinnules or none pinnate.
        Pinnules acute or aculeate.
          Segments of pinnae mostly connected..... 3. *P. aculeatum*
          Pinnules mostly free.
            Free pinnules less than 15 pairs.
              Sori costal to medial.
                Some pinnae over 15 cm long..... 3. *P. aculeatum*
                Pinnae smaller.
                  Pinnules weakly mucronate..... 3. *P. aculeatum*
                  Pinnules very mucronate ..... 4. *P. Archboldii*
              Sori submarginal ..... 5. *P. Brassii*
            Free pinnules about 20 pairs..... 6. *P. bolanicum*
        Pinnules rounded, hardly mucronate.
          Pinnules crenate to entire ..... 7. *P. muticum*
          Pinnules incised to subpinnate ..... 8. *P. Myer-Dreesii*
    Lamina usually under 25 cm long.
      Stipes conspicuously stout ..... 9. *P. papuanum*
      Stipes slender.
        Pinnules acute ..... 10. *P. kinabaluense*
        Pinnules rounded ..... 11. *P. alpinum*
  Pinnules and segments strongly bullate.
    Frond lanceolate ..... 12. *P. cheilanthoides*
    Frond linear ..... 13. *P. lineare*

1. P. KEYSSERIANUM Ros.

P. keysserianum Ros., Fedde's Repert. **10** (1912) 331.

Keysser 60, Sattelberg, alt. 1,600 m. isotype in Herb. Univ. Calif.; also, *Keysser 19*, much less dissected than the type. Endemic.

2. P. BAMLERIANUM Ros.

P. bamlerianum Ros., Fedde's Repert. **10** (1912) 330.

Bamler K 10, Cromwell Mountains, alt. 1,600 m, isotype in Herb. Univ. Calif. Our specimen of *Bamler K 10 a,* var. *ferrugineo-paleacea,* a segregate from the type collection, is also tripinnate, but is more ample and more scaly; it is approximately *P. moluccense* (Blume) Moore; but as it does not fit Rosenstock's varietal description, some error is suspected. Endemic.

3. P. ACULEATUM (L.) Schott

P. aculeatum (L.) Schott, Genera (1834) *Pl. 9,* note.

Construed in its usual broad sense, this can include *Brass 12666,* alt. 2,150 m; *13665,* alt. 700 m; and *13384,* alt. 850 m; *Bamler 138* (1914); and *Keysser 203;* these represent a single species. Related to it is *Schlechter 16921,* received as *P. aculeatum* var. *subamoenum* Christ, a doubtful identification. *Keysser 201* is distinct, but is more like the *P. aculeatum* of Europe than is any other New Guinea collection.

Cosmopolitan, as construed.

4. P. ARCHBOLDII Copel. **Plate 1.**

P. Archboldii Copel., Univ. Calif. Publ. Bot. **18** (1942) 221.

P. gregis P. aculeati lamina coriacea rhachi inter alias paleis lanceolatis patentibus onusta; rhizomate adscendente 5–8 mm crasso, paleis atrocastaneis 1 cm longis basibusque stipitum profunde immerso; stipite 30 cm alto, erecto, sordide fusco, paleis variis maximis 13 mm longis 2.5 mm latis apice aciculari-bus dentibus minutis remotis recte distantibus ciliolatis ornato et furfuraceo; lamina 40 cm longa, 12 cm lata, acuminata, subtripinnata, rhachi paleis 5 mm longis lanceolatis aciculari-acuminatis rectis vel tortis integris vel ciliatis ornata aliisque variis et acicularibus et amorphis dense vestita; pinnis infimis 8 cm longis vix deflexis, sequentibus 9 cm longis breviter (2 mm) pedicellatis, acutis, basi oblique truncatis, rhachibus paleis minoribus vestitis; pinnulis ca. 15-paribus, mucronatis, infimis acroscopicis maximis ca. 17 mm longis, basi obliquis, pinnula secundaria una acroscopica, pinnulis sequentibus auriculatis gradatim apicem brevem incisum versus pinnae decrescentibus, utraque facie pilis paucis debilibus vestitis; soris inframedialibus, indusiis parvis peltatis fugacibus.

Dutch New Guinea: 7 km N-E. of Wilhelmina-top, alt. 3,560 m, *Brass & Myer-Drees No. 9850.* "Subalpine forest; occasional on mossy forest floor; clumps 60–80 cm high; fronds 3 or 4."

5. P. BRASSII Copel. sp. nov. **Plate 2.**

P. gregis P. aculeati tenuiter coriaceum soris submarginalibus; rhizomate ignoto; stipite 30 cm alto, gracile, fusco, deorsum paleis nigro-fuscis 5 mm longis lanceolatis acuminatis appressis vel inflexis sat dense minute denticulato-ciliatis, sursum paleis setiformibus haud dense vestito; lamina 30 cm longa, 12 cm lata, abrupte acuminata, apice 8 cm longo tantum pinnato, alibi bipinnata, rhachi atropurpureo-fusca paleis 1.5–3 mm longis linearibus contortis castaneis basibus dilatatis hinc inde ramiferis strigosa; pinnis infimis 7 cm longis subdeflexis, sequentibus 8 cm longis falcato-adscendentibus, acuminatis, breviter (1.5 mm) pedicellatis, rhachibus deorsum setoso-paleolatis sursum nudis; pinnulis infra apicem inciso-pinnatifidum pinnae ca. 12, mucronatis, infima acroscopica maxima 1 cm longa, 5–6 mm lata incisa, sequentibus gradatim decrescentibus contiguis interdum oblique rhomboideis argute serratis dentibus minute mucronatis, utraque facie mox glabris, superne fuscis inferne pallide olivaceis; soris submarginalibus parvis, indusio minuto peltato caduco.

Dutch New Guinea: Bele River, alt. 2,300 m; *Brass No. 10247.* "Occasional tufts in forest."

6. P. BOLANICUM Ros.

P. bolanicum Ros., Fedde's Repert. **12** (1913) 170.

Bolan, alt. 3,400–3,800 m, *Keysser B 8* 1912, isotype in Herb. Univ. Calif. Perhaps too near to *P. microphyllum* (Blume) Presl.

P. BOLANICUM var. OVALIFOLIA Ros.

Bolan, alt. 2,400–3,000 m, *Keysser B 42,* also in Herb. Univ. Calif., bearing the comment "potius spec. propria," with which I agree, although the species and variety are evidently nearly related. Endemic.

7. P. MUTICUM Copel. **Plate 3.**

P. muticum Copel., Univ. Calif. Publ. Bot. **18** (1942) 221.

Rhizomate erecto, paleis fuscis 2–2.5 cm longis linearibus aciculatis integris dense immerso; stipitibus fasciculatis, 15–18 cm altis, 1.5 mm crassis, ochroleucis, paleis patentibus concoloribus medio brunnescentibus 5 mm longis ovatis oblique acutis nonnulis mucronulatis papyraceis primo integris denique plus minus laceris postquam dejectis cicatrices fuscas relinquentibus ornatis; lamina 35 cm longa, 13 cm lata, acuminata, bipinnata, rhachi quam stipite densius paleis minoribus vestita; pinnis

infimis 5 cm longis 2 cm latis deflexis, medialibus 7 cm longis basi 2.5 cm alibi 2 cm latis, subfalcatis, obtusis vel breviter mucronulatis, breviter pedicellatis, rhachibus paleolatis sursum nudis; pinnulis ca. 9-paribus, contiguis, oblique oblongis, rotundatis, undulato-crenatis vel fere integris, subcoriaceis, glabris; soris medialibus, e facie superiore laminae expressis, indusio parvo orbiculare sat persistente.

Dutch New Guinea: Bele River, alt. 2,200 m; *Brass 11434,* type, "Numerous clumps on dry face of limestone cliff in forest shade;" *No. 11433,* from the same place, a small juvenile plant, with particularly small paleae, the pinnae with 0–2 basal pinnules.

8. P. MYER-DREESII Copel. **Plate 4.**

P. Myer-Dreesii Copel., Univ. Calif. Publ. Bot. **18** (1942) 221.

P. mutico affine, paleis rhizomatis atrocastaneis, stipitis rhacheosque castaneis aciculari-lanceolatis, pinnulis paullo majoribus, infimis basi pinnula secundaria una prseditis, sequentibus pinnatisectis, indusiis magnis interdum excentrice adnatis etenim rarissime orbiculari-reniformibus diversum.

Dutch New Guinea: 7 km N-E. of Wilhelmina-top, alt. 3,560 m. *Brass & Myer-Drees No. 10033;* "Clumped under rocks in subalpine forest."

9. P. PAPUANUM C. Chr.

P. papuanum C. Chr., Brittonia **2** (1937) 299.

Brass 9136, Lake Habbema, alt. 3,225 m, "Forming dense clumps 20–30 cm high and up to 1 m in diameter in forest glades;" *Brass & Myer-Drees 10055* and *10112,* Mt. Wilhelmina, alt. 3,950 m. *No. 10055* is "one of the few plants on limestone screes; clumps 20–40 cm high, scattered amongst the rocks." It and *No. 9136* are more or less dwarfed. *No. 10112,* "Under a rock on Alpine grassland," has responded to its more sheltered position by producing somewhat more ample fronds, almost flat pinnules, and longer, paler, less congested paleae on stipe and rachis. The previous collection are *Brass 4350* (type) and *4690,* dwarfed.

10. P. KINABALUENSE C. Chr.

P. kinabaluense C. Chr., Gardens' Bull. **7** (1934) 255.

Mt. Albert Edward, alt. 3,680 m, *Brass 5678,* det. Christensen. Borneo.

11. P. ALPINUM Ros.

P. alpinum Ros., Fedde's Repert. 12 (1913) 171.

Brass 9483, Lake Habbema, alt. 3,225 m, "under rocks in edge of forest; fronds spreading"; *Brass & Myer-Drees 9766, 9967, 10338,* Mt. Wilhelmina, alt. 3,500–3,800 m. Variable, and none exactly like the type, *Keysser B 5* (1912), isotype in Herb. Univ. Calif. Judging by its long and comparatively naked stipe, the type grew in a sheltered place, perhaps under a rock. Endemic.

12. P. CHEILANTHOIDES Copel. **Plate 5.**

P. cheilanthoides Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

Papuapteris ampla subtripinnata, rhizomate erecto, 2 cm (cum basibus stipitum, 4 cm) crasso, basibusque stipitum paleis primo rufis, deinde atro-fuscis tum demum nigris nitidis usque ad 3 cm longis 3 mm latis aculeato-attenuatis primo integris demum fisso-ciliatis vestitis; stipitibus fasciculatis, 25–30 cm altis 3–5 mm crassis, paleis sursum decrescentibus et variis densis vestitis etiam squamulosis; lamina ca. 35 cm longa, 5–7 cm lata, rhachibus paleis polymorphis et lanceolatis majoribus et ovatis minutis et setiformibus plerisque strigoso-ciliatis sursum pallescentibus ubique dense onustis; pinnis infimis ca. 4 cm remotis paullo reductis haud deflexis, medialibus 5–6 cm longis 1 cm latis, adscendentibus, sessilibus, obtusis; pinnulis infimis usque ad 9 mm longis, pinnatis cum pinnulis secundariis 1-3-paribus, sequentibus rarius pinnatis saepius pinnatifidis, plerisque integris oblongis rotundatis bullatis, coriaceis, superne plus minus decidue crinito-setosis, inferne dense paleatis et strigosis; soris infra paleas et margines revolutos plus minus occultis, indusiis ut videtur nullis, cellulis annulorum ca. 17, sporis oblongis densissime echinatis.

Dutch New Guinea: 11 km N-E. of Wilhelmina-top, alt. 3,400 m; *Brass & Myer-Drees No. 9801,* type, "Grassy bottom of a stream; fronds erect in large clumps;" also, *No. 10102,* alt. 4,100 m. "Common on rocky grassy slopes; clumps 60 cm high; southern slopes of Mt. Wilhelmina."

I believe that most pteridologists will agree in placing this species in *Polystichum.* In the Orient, it is rather isolated by its strongly bullate pinnules, but this would not be so among Andean species of the genus.

13. P. LINEARE (C. Chr.) Copel., comb. nov.

Papuapteris linearis C. Chr., Brittonia **2** (1937) 300, *f. 2.*

Brass 4304, Mt. Albert Edward, alt. 3,690–3,980 m; cited also from Owen Stanley Range and Mt. Victoria.

Endemic, and apparently of endemic parentage. Nearly related to the preceding species.

5. CYCLOPELTIS J. Smith

Key to the species

Pinnae not hastate	1. *C. presliana*
Pinnae hastate on upper side	2. *C. novoguineensis*

1. C. PRESLIANA (J. Smith) Berkeley

C. presliana (J. Smith) Berkeley, Crypt. Bot. (1857) 517.

Brass 8860, Hollandia, sea level; *Schlechter 16284,* alt. 300 m; *Bamler 64* (1909), Logaueng; *King 469,* Papua.

Malaya; Philippines. Specimens from the Caroline and Gilbert Islands and Tonkin have been referred to this species.

2. C. NOVOGUINEENSIS Ros.

C. novoguineensis Ros., Fedde's Repert. **10** (1912) 329.

Known locally only by the type collection, *Bamler, Rosenstock Fil. novog. exsicc. n. 86,* Logaueng, alt. 300 m; isotype in Herb. Univ. Calif.

Solomon Islands.

6. DIDYMOCHLAENA Desvaux

D. TRUNCATULA (Swartz) J. Smith

Brass 12155, alt. 1,750 m; *Schlechter 17694,* alt. 300 m; *Bamler, Rosenstock Fil. novog. exsicc. n. 225,* Sattelberg, alt. 900 m; *King 484,* Papua. All New Guinea specimens represent var. *ozeanica* Ros., Fedde's Repert. **5** (1908) 374, characterized chiefly by small pinnules.

7. RUMOHRA Raddi

Key to the species

Indusium large, peltate	1. *R. adiantiformis*
Indusium small, round-reniform to peltate	2. *R. aristata*
Indusium wanting	3. *R. Hasseltii*

1. R. ADIANTIFORMIS (Forster) Ching

R. adiantiformis (Forster) Ching, Sinensia **5** (1934) 70.

Dryopteris discophora Ros., Fedde's Repert. **12** (1913) 172.—"Eine durch ihre grossen schildförmigen Indusien sehr auffal-

lende Art." Isotype in Herb. Univ. Calif.; *Clemens s. n.*, Mt. Sarawaket, alt. 3,000–10,000 feet.

All Southern lands.

2. R. ARISTATA (Forster) Ching

R. aristata (Forster) Ching, Sinensia 5 (1934) 50.

Brass 5177 and *5202*, *Bamler 49p* and *Bamler, Rosenstock Fil. novog. exsicc. n. 166* are this species, broadly construed. *Carr 14388* is similar but distinct, but does not well fit Blume's description of *Aspidium appendiculatum*.

India across Polynesia.

3. R. HASSELTII (Blume) Ching

R. Hasseltii (Blume) Ching, Sinensia 5 (1934) 61.

Bamler 110 (1914), Sattelberg, alt. 800–900 m.

Java to Leyte, Formosa and Assam.

8. BOLBITIS Schott

Genera (1834) *Plate 14;* Ching, in C. Chr., Suppl. III (1934) 47. *Campium* Presl.; Copel., Philip. Jour. Sci. 37 (1928) 341 *partim*.

Because the formation of fertile fronds is seasonal or occasional, this genus is likely to be passed over by collectors. It seems to be poorly developed in New Guinea, where only 5 species have been reported, in contrast with 15 in the Philippines.

Key to the species

Apex of frond a leaflet, like lateral pinnae ..... 1. *B. heteroclita*
Apex formed by fusion of decrescent pinnae.
  Pinnae shallowly cut.
    Lamina over 30 cm long ..... 2. *B. quoyana*
    Lamina smaller.
      Main veins evident ..... 3. *B. Taylori*
      Main veins undeveloped ..... 4. *B. parva*
  Pinnae deeply pinnatifid ..... 5. *B. arguta*

1. B. HETEROCLITA (Presl) Ching

B. heteroclita (Presl) Ching, in C. Chr., Suppl. III (1934) 48.
Campium heteroclitum Copel., Philip. Jour. Sci. 37 (1928) 359, *f. 13*.

Idenburg River, alt. 250 m, *Brass 13242;* Papua, *King 265, 284*.

Caroline Islands to China and India.

2. B. QUOYANA (Gaud.) Ching

B. quoyana (Gaud.) Ching, *ibid.* 49.
Campium quovanum Copel., *ibid.* 366, *f. 20*.

Schlechter 16236, Kaiser-Wilhelmsland. From Papua, I have four collections by King, all showing a tendency to confine the sporangia to a marginal band, and leave the costal area of fertile pinnae sterile. One of these was named *Leptochilus cuspidatus* (Presl) var., *marginalis* Ros., Fedde's Repert. 9 (1911) 426. They also represent *Heteroneuron Naumanni* Kuhn, described from New Hanover, which I do not regard as distinct.

New Hebrides to Java and Samar.

3. **B. TAYLORI (Bailey) Ching**

B. Taylori (Bailey) Ching, *ibid.* 50.
Campium Taylori Copel., *ibid.* 374.

Brass 12833, "abundant on rocks in a rain-forest stream at 1,150 m alt," 6 km SW. of Bernhard Camp, Idenburg River, is approximately this species. Queensland.

4. **B. PARVA (Copel.) Ching**

B. parva (Copel.) Ching, *ibid.* 49.
Campium parvum (Copel., *ibid.* 375, *Pl. 21* and *f. 28.*

Schlechter 16163, Kaiser-Wilhelmsland, alt. 300 m. *King 269* from Papua, is similar in appearance. A single specimen from Mrs. Clemens, from Morobe, alt. 4,200 feet, looks very distinct, being larger, with few broad pinnae, but may possibly be the same species in ample development.

Endemic.

5. **B. ARGUTA (Fée) Ching**

B. arguta (Fée) Ching, *ibid.* 47.
Heteroneuron argutum Fée, Acrost. (1845) 96, *Pl. 25, f. 2.*
Campium argutum Copel., *ibid.* 376, *Pl. 22.*

Brass 13473, "Several tufts on the bank of a rain-forest stream at 800 m alt," 2 km SW. of Bernhard Camp, Idenburg River.

Luzon.

In the Philippines, where they are better known, some *Bolbitis* species are notoriously variable. With the three preceding species represented by a total of 5 collections, of which no two are fully identical, their distinctness and their identity are for the present uncertain.

9. LOMARIOPSIS Fée

Key to the species

Fertile pinnae up to 3 mm wide.
Sterile pinnae lanceolate ..... 1. *L. cochinchinensis*
Sterile pinnae oblanceolate ..... 2. *L. Kingii*
Fertile pinnae 5–10 mm wide ..... 3. *L. subtrifoliata*
Fertile pinnae up to 20 mm wide ..... 4. *L. intermedia*

1. L. COCHINCHINENSIS Fée

L. cochinchinensis Fée, Acrost. (1845) 68, *Pl. 27;* Holttum, Gardens' Bull. 5 (1932) 266.

Bamler 50, Bamler, Rosenstock, Fil. novog. exsicc. n. 251, Sattelberg, alt. 300–700 m.

To Indo-China.

2. L. KINGII (Copel.) Holttum

L. Kingii (Copel.) Holttum, Gardens' Bull. 5 (1932) 273.
Stenochlaena Kingii Copel., Philip. Jour. Sci. 6C (1911) 80.

Known only by the type collection, *King 285,* from Papua; perhaps not sufficiently distinct from *L. cochinchinensis.*

3. L. SUBTRIFOLIATA (Copel.) Holttum

L. subtrifoliata (Copel.) Holttum l.c. 274.

Brass 13882, alt. 120 m, climbing 4–5 m on small trees. Typical except for fewer pinnae, larger sterile pinnae, and less scaly stipe; pinnae sessile.

Southern Philippines.

4. L. INTERMEDIA (Copel.) Holttum

L. intermedia (Copel.) Holttum, l. c.
Stenochlaena intermedia Copel., Philip. Jour. Sci. 7C (1912) 67.

Known only by the type collection, *King 370,* from Ambasi, Papua. Very distinct.

10. THYSANOSORIA Gepp

T. PTERIDIFORMIS (Cesati) C. Chr.

T. pteridiformis (Cesati) C. Chr., Suppl. III (1934) 187; Dansk Bot. Arkiv 9 No. 3 (1937) 51.
T. dimorphophylla Gepp, Dutch N. W. New Guinea (1917) 193, *Plate 4.*

Arfak Peninsula, *Cesati, Gibbs.* Unknown to me.

Local.

11. TERATOPHYLLUM Mettenius

T. ACULEATUM (Blume) Mett.

T. aculeatum (Blume) Mett., in Kuhn, Ann. Mus. Lugd Bat. 4 (1869) 296; Holttum, Gardens' Bull. 5 (1932) 284, *Pls. 2, 3,* and *figs. 38–40.*

Werner 64, Damun; also cited by Holttum, l. c. 289, are *Lam 424* and *1105.*

Malaya; Philippines.

12. ARTHROBOTRYA J. Smith

A. ARTICULATA J. Smith

A. articulata J. Smith, Hist. Fil. (1875) 142.

Brass 12202, Idenburg River, alt. 1,700 m; *Clemens 11011,* Morobe; *King 490, Brass 1468,* Papua.

Philippines; Celebes; Solomon Islands.

13. LOMAGRAMMA J. Smith

Key to the species

Sterile pinnae at least 15 mm wide.
- Pinnae with winged stalks ..... 1. *L. sinuata*
- Pinnae hardly stalked ..... 2. *L. novoguineensis*

Sterile pinnae 8 mm wide ..... 3. *L. angustipinna*

1. L. SINUATA C. Chr.

L. sinuata C. Chr., f. *papuana* C. Chr., Brittonia 2 (1937) 302.

Brass 13752, Idenburg River, alt. 75 m; scandent 7–8 m. This is a perfect match for *Brass 5195,* the basis of the *forma.* It is to be observed that the very large pinnae are short-stalked. Holttum, Gardens' Bull. **9** (1937) 216 has noted that the long pedicels of the pinnae, originally a characteristic of the species, are inconstant. The fertile pinnae are 3–4 mm wide.

The species in New Guinea, Celebes, Borneo and Java.

2a. L. LOMARIOIDES (Blume) J. Smith?

L. novoguineensis (Brause) C. Chr., Suppl. III (1934) 124.
Leptochilus novoguineensis Brause, Engler's Jahrb. **56** (1920) 117.

Ledermann 9524, alt. 850 m; *Docters van Leeuwen 9616,* Mamberamo River, alt. 50 m.

Endemic. See Holttum, Gardens' Bull. **9** (1937) 209, *Plate 15.*

2a. L. LOMARIOIDES (Blume) J. Smith?

Brass 13751, with *L. sinuata,* scandent to 8 m. Pinnae sessile, broadly obliquely cuneate, rather thin, but not satisfactorily distinguishable from the Java plant; fertile pinnae about 2 mm wide.

Brass 12950, alt. 1,200 m, scandent 3–4 m. Pinnae sessile with broad, approximately truncate bases; fertile pinnae 4 mm wide; stipes 10 cm long. Except for the long stipe, this would be more like *L. Brooksii.*

These two specimens are conspecific, whatever the species; and I suspect that they are variants of a species including *No. 13752.* Altogether, there are too few and too imperfect collections in this genus to afford dependable conclusions as to variability. *L. lomarioides* is regarded by Holttum as strictly Javanese.

3. L. ANGUSTIPINNA Copel. Plate 6a.

L. angustipinna Copel., Univ. Calif. Publ. Bot. 18 (1942) 222.

Rhizomate scandente, sicco 5 mm crasso, basique stipitis paleis atrocastaneis 1–2 mm longis late lanceolatis squamulisque amorphis brunneis sparsis; bathyphyllis ignotis; frondis sterilis stipite 14 cm longo, gracile, stramineo; lamina 50 cm longa, 20 cm lata, pinna terminale 7 cm longa non articulata, pinnis lateralibus ca. 30-paribus articulatis, inferioribus decrescentibus, medialibus ca. 10.5 cm longis 8 mm latis, falcato-acuminatis, subsessilibus, basi basiscopice angustissime acroscopice latius cuneatis, integris, herbaceis, costa inferne decidue paleolatis; venis tenuibus inconspicuis, areolarum seriebus 2 vel 3 irregularibus; rhachi paleis fuscis linearibus ca. 1 mm longis basi interdum dilatatis sparsa; frondis fertilis pinnis breviter (2 mm) stipitulatis, usque ad 9 cm longis et 3 mm latis, sporangiis purpurascentibus.

Dutch New Guinea: 2 km SW. of Bernhard Camp, Idenburg River, alt. 750 m, *Brass 13446;* "Climbing epiphyte abundant on substage trees." Type in Gray Herbarium.

In spite of doubt as to the stability of various characters, and as to the distinctness of species based on them in this genus, I find it impossible to refer this specimen even approximately to any known species. The narrow sterile pinnae are unique in the genus, as is also the combination of thin lamina and inconspicuous venation. The dark-reddish sporangia suggest those occasionally found on more than one species of *Bolbitis,* and on *Teratophyllum Williamsii.*

14. ELAPHOGLOSSUM Schott

Key to the species

Small plants, lamina under 5 cm long.
  Paleae light-brown, subciliate.
    Stipe of sterile frond under 1 cm long ..... 1. *E. bolanicum*
    Stipe of sterile frond over 2 cm long ..... 2. *E. habbemense*
  Paleae dark, ciliate ..... 3. *E. hellwigianum*

Larger plants.
  Fronds clustered or approximate.
    Fronds narrowly lanceolate, scaly ..... 4. *E. petiolatum*
    Fronds broader or glabrescent.
      Margin conspicuously fringed ..... 5. *E. Cumingii*
      Margin not fringed.
        Stipe conspicuously scaly ..... 6. *E. sordidum*
        Stipe glabrescent.
          Lamina conspicuously decurrent.
            Lamina under 30 cm long ..... 7. *E. novoguineense*
            Lamina over 40 cm long ..... 8. *E. Archboldii*
          Lamina acute at base ..... 9. *E. sclerophyllum*
  Rhizome elongate, fronds seriate.
    Lamina half as wide as long ..... 10. *E. laticuneatum*
    Lamina relatively narrow.
      Paleae broad, light-brown ..... 11. *E. angulatum*
      Paleae narrow and dark.
        Base of lamina abruptly narrowed ..... 12. *E. brunneum*
        Base cuneate or decurrent.
          Rhizome 1.5–2 mm thick ..... 13. *E. repens*
          Rhizome much stouter ..... 14. *E. fuscum*

1. E. BOLANICUM Ros.

E. bolanicum Ros., Fedde's Repert. **12** (1913) 180.

Bolan Mts. alt. 2,400–3,000 m, *Keysser* (1912) *B 62;* isotype in Herb. Univ. Calif., including sterile frond.

2. E. HABBEMENSE Copel. **Plate 7.**

E. habbemense Copel., Univ. Calif. Publ. Bot. **18** (1942) 226.

Rhizomate late repente, 1–2 mm crasso, paleis ferrugineis 1–2 mm longis plerisque ovatis subintegris haud dense vestito; stipitibus ca. 1 cm remotis, frondis sterilis ca. 2.5 cm longis, 1 mm crassis, exalatis, paleis iis rhizomatis conformibus sursum decrescentibus vestitis, frondis fertilis breviore; lamina sterile ca. 2.5 cm longa, 8 mm lata, utrinque acuta, mox glabrescente, rigide coriacea, fusca, margine cartilagineo subdeflexo; lamina fertile conforme sed basi rotundata.

Dutch New Guinea: Lake Habbema, alt. 3,225 m, *Brass No. 9083,* type in Gray Herbarium. "In a cushion of hepatics on exposed branch of tree." Only one plant, with one fertile and several sterile fronds.

A dwarf, perhaps related to *E. laurifolium,* but not to the other dwarfs known in New Guinea.

3. E. HELLWIGIANUM Ros.

E. hellwigianum Ros., Nova Guinea **8** (1912) 731.

Dutch New Guinea: summit of Hellwig Mts., *von Roemer 1273*. Not seen.

4. **E. PETIOLATUM (Swartz) Urban**

E. petiolatum (Swartz) Urban, Symb. Ant. IV (1903) 61.

Keysser (1910) *K 11; Brass 5484*, Mafulu, alt. 1,250 m. I have in hand both of these collections, both determined as *E. Copelandii* Christ. Neither exactly matches that Philippine species, which is a member of the world-wide group of *E. petiolatum*. As an alternative name for the New Guinea plant, I would prefer *E. Blumei* J. Smith.

5. **E. CUMINGII (Fée) Moore var. PAPUANUM C. Chr.**

E. Cumingii (Fée) Moore, var. *papuanum* C. Chr., Brittonia **2** (1937) 317.

Mt. Tafa, alt. 2,300 m, *Brass 4112*.

This is a satisfactory match for some Philipppine specimens.

6. **E. SORDIDUM Christ**

E. sordidum Christ, Nova Guinea **8** (1909) 156.

Dutch New Guinea: North River, near Geitenkamp, *Versteeg 1432*. Not seen. Brause lists 5 subsequent collections by Ledermann in Kaiser-Wilhelmsland. Christ remarked that this was the first *Elaphoglossum* known in New Guinea.

7. **E. NOVOGUINEENSE Ros.**

E. novoguineense Ros., Fedde's Repert. **10** (1912) 341.
E. Brassii C. Chr., Brittonia **2** (1937) 316.

Sattelberg, *Bamler 67* (1909), isotype in Herb. Univ. Calif.; *ibid., Keysser 226* (1913); Mafulu, alt. 1,950 m, *Brass 5558, E. Brassii;* Bele River, *Brass 11498*.

Endemic.

8. **E. ARCHBOLDII Copel.** **Plate 8.**

E. Archboldii Copel., Univ. Calif. Publ. Bot. **18** (1942) 226.

Rhizomate breve, crasso, stipitibus radicibusque ubique obsito, etiam paleis sordide fuscis ca. 2 mm longis ovatis integris vestito; stipitibus fasciculatis, basibus (phyllopodiis) castaneis 3–4 cm altis, 3–4 crassis, paleis quam iis rhizomatis longioribus sparsis; frondis sterilis stipite 10–30 cm alto, decurrenti-alato, fusco; lamina 40–50 cm longa, 5.5 cm lata, acuta, coriacea, margine subdeflexo, utraque facie glabrescente, venis manifestis, furcatis; frondis fertilis stipite 30–45 cm alto, sursum brevi-

alato, glabrescente, lamina ca. 30 cm longa, 2–3 cm lata, costa deorsum et margine angusto exceptis sporangiis densissime obtecta.

Dutch New Guinea: 4 km SW. of Bernhard Camp, Idenburg River, alt. 850–900 m, *Brass 13220,* type in Gray Herbarium; *ibidem, No. 13484.*

A large relative of *E. callifolium,* with smaller and darker paleae, the stipe of the sterile frond winged almost to the base.

9. E. SCLEROPHYLLUM v.A.v.R.

E. sclerophyllum v.A.v.R., Nova Guinea **14** (1924) 22.

Doorman-top, alt. 3,200 m, *Lam 1793.* Not seen.

10. E. LATICUNEATUM Copel. Plate 9.

E. laticuneatum Copel., Univ. Calif. Publ. Bot. **18** (1942) 226.

Rhizoma te late repente, 2–3 mm crasso, paleis fuscis nigrescentibus ovato-lanceolatis 2–3 mm longis acuminatis irregulariter ciliatis vestito; stipitibus valde remotis, phyllopodiis obscuris paleaceis 1–1.5 cm altis, frondium sterilium ca. 8 cm altis fusco-stramineis squamulis paucis onustis; lamina sterile 6–8 cm longa, 2.5–4 cm lata, apice rotundata, basi cuneata, coriacea, margine angustissime cartilaginea, utraque facie squamis elongato-triangularibus acuminatis 1 mm longis pauci-ciliatis atris sparsa; frondis fertilis stipite 15 cm alto, lamina 8 cm longa, vix 4 cm lata, sterili conforme.

Dutch New Guinea: 7 km NE. of Wilhelmina-top, alt. 3,560 m, *Brass & Myer-Drees 10032,* type in Gray Herbarium. "One plant in moss of forested cliff."

Related to *E. fuscum.*

11. E. ANGULATUM (Blume) Moore

E. angulatum (Blume) Moore, Index (1857) 5.

Lake Habbema region, *Brass 10504, 11036, 11042, 11499.* New to New Guinea. Java; Borneo; Philippines.

12. E. BRUNNEUM Copel. Plate 10.

E. brunneum Copel., Univ. Calif. Publ. Bot. **18** (1942) 226.

Rhizomate repente, 2.5–4 mm crasso, paleis 3–4 mm longis lanceolatis attenuatis subintegris squarrosis aterrimis nitidis dense vestito; phyllopodiis indistinctis; stipitibus ca. 1 cm remotis, 10–20 cm altis, fusco-stramineis, basibus exceptis glabrescentibus; lamina sterile ca. 17 cm longa, 4 cm lata, apice acuta, basi abrupte et breviter cuneata, margine anguste carti-

laginea, squamulis minutis amorphis fissis sparsa, superne glabrescente, venis vix conspicuis, lamina fertile ca. 12 cm longa, 2 cm lata, aliter conforme.

Dutch New Guinea: 6 km. SW. of Bernhard Camp, Idenburg River, alt. 1,200 m, *Brass 12808,* type in Gray Herbarium; epiphyte, near the ground, in rain forest.

13. E. REPENS Copel. **Plate 11.**

E. repens Copel., Univ. Calif. Publ. Bot. **18** (1942) 226.

Rhizomate repente, 1.5 mm crasso, paleis atris 2–3 mm longis lanceolatis attenuatis integris haud densis vestito; stipitibus 0.5–2.0 cm remotis, phyllopodiis obscuris ca. 1 cm. longis; stipitibus frondium sterilium ca. 4 cm, fertilium 8–14 cm altis, stramineis, mox glabratis; lamina sterile ca. 10 cm longa, 3 cm lata, apice rontundata, basi sensim cuneata, breviter decurrente, margine anguste deflexo cartilagineo, coriacea, glabrescente, venis inconspicuis, lamina fertile minore.

Dutch New Guinea: 15 km SW. of Bernhard Camp, Idenburg River, alt. 1,800 m, *Brass 12124;* frequent low epiphyte in mossy forest.

14. E. FUSCUM Copel. **Plate 12.**

E. fuscum Copel., Univ. Calif. Cont. Bot. **18** (1942) 226.

Rhizomate repente, 3–4 mm crasso, paleis fuscis nigrescentibus 4–5 cm longis ovatis et lanceolatis acuminatis sparse et irregulariter ciliatis plerisque appressis dense vestito; stipitibus 1–3 cm remotis, phyllopodiis 1–2 cm altis vix distinctis dense paleatis, frondium sterilium ca. 10 cm altis, 2 mm crassis, sulcatis, stramineis vel fusco-stramineis, paleis sursum decrescentibus sparsis, frondium fertilium 15–30 cm altis; lamina 10–15 cm longa, 2.5–4 cm lata, apice rotundata, basi cuneata vix decurrente, coriacea, sordide fusca, margine angustissime cartilaginea, squamis atris 1 mm longis et amorphis et triangularibus grosse ciliato-dentatis sparsa, superne subglabrescente, lamina fertile conforme.

Dutch New Guinea: Lake Habbema, alt. 3,225 m, *Brass 9088,* type, "plentiful in ground moss of open thickets;" *ibidem,* epiphytic, *Nos. 9354, 9355;* Bele River, 2,200 m, *Nos. 11040, 11071.*

There are several other New Guinea collections of *Elaphoglossum.* In Philip. Jour. Sci. **6C** (1911) 92, I reported a doubtful *E. conforme* from Goodenough Bay, *King 212;* it is not that species, nor fit for identification. Better specimens, both apparently new, but left undescribed, are *King 482,* from the

mountains behind Medan; and *Brass 4772,* from Murray Pass, alt. 2,840 m.

15. DRYOPTERIS Dryander

Key to the species

Pinnae subpinnate ..... 1. *D. paleacea*
Frond at least tripinnatifid at base.
  Lowest pinnae much enlarged ..... 2. *D. sparsa*
  Lowest and succeeding pinnae similar.
    Sterile pinnules hardly pinnate.
      Fronds uniform ..... 3. *D. bamleriana*
      Fronds somewhat dimorphic ..... 4. *D. pseudoparasitica*
    Pinnules freely compound ..... 5. *D. subarborea*

1. D. PALEACEA (Swartz) C. Chr.

D. paleacea (Swartz) C. Chr., Amer. Fern Jour. 1 (1911) 94.

Brass 9138, Lake Habbema, alt. 3,225 m; *No. 10283,* alt. 2,800 m; *No. 4409,* Mt. Albert Edward, alt. 3,680 m.

At major altitudes in Borneo, Philippines, Formosa, Hawaii, India and China, Madagascar, Tropical America.

2. D. SPARSA (Ham.) O. K.

D. sparsa (Ham.) O. K., Rev. Gen. Pl. II (1891) 813.
D. papuana C. Chr., see Brittonia 2 (1937) 298.

Brass 10248, Bele River, alt. 2,300 m; *Brass 4128, 4781,* Papua, Central Division, alt. 2,100 and 1,900 m. The type of *D. papuana* (*Nephrodium dissitifolium* Baker) was from Mt. Scratchley, alt. 10,000–13,000 feet.

To India.

3. D. BAMLERIANA Ros.

D. bamleriana Ros., Fedde's Repert. 10 (1912) 334.

The type is *Bamler 52,* Sattelberg, *Brass 13053,* Idenburg River, alt. 850 m, is too similar to be distinguished, but is apparently without paraphyses. It is an epiphyte, with short-creeping rhizome.

Endemic.

Related to *D. bamleriana,* but distinct, is *Carr 13386,* received from the British Museum (Mr. Alston) as *D. Petelotii.*

4. D. PSEUDOPARASITICA v.A.v.R.

D. pseudoparasitica v.A.v.R., Nova Guinea 14 (1924) 19.

Brass 12067, "occasional low epiphyte in mossy forest at 1,800 m." Frond herbaceous; very similar to *D. bamleriana*

except for dimorphism. The type is *Lam 1946,* Doorman-top, alt. 2,480 m.

5. **D. SUBARBOREA (Baker) C. Chr.**

D. subarborea (Baker) C. Chr., Index (1905) 295.

Brause, Engler's Jahrb. **56** (1920) 94, refers to this species 12 collections by Ledermann. Rosenstock, Fedde's Repert. **12** (1913) 173, 174, has described varieties:

attenuata, Keysser S. 134, Sattelberg, alt. 800–1,000 m.
quadripinnata, Keysser B 83 (1912) Bolan, 2,400–3,000 m.
decomposita, Keysser B 52, Bolan, 2,400–3,000 m.
biformis, Keysser 39, 40, Bolan, 2,400–3,000 m.

We have isotypes of vars. *quadripinnata* and *biformis;* also, *Bamler, Rosenstock Fil. novog, exsicc. n. 229,* labelled simply *D. subarborea.* I do not believe that these are all one species. *Brass 12107,* "a common low-climbing epiphyte in the mossy forest at 1,800 m;" seems by description to be var. *attenuata.* The group is a difficult one, of more than one confused species in Java (as *D. purpurascens*), in Borneo, and in the Philippines, as well as in New Guinea; commonly represented in herbaria by minor fragments of fronds.

16. CTENITIS Christensen

Key to the species

Frond tripinnatifid or more compound.
  Lowest pair of pinnae much enlarged ..... 1. *C. dissecta*
  Lower pinnae all similar.
    Stipe sparsely hairy.
      Lamina over 40 cm long ..... 2. *C. hypolepioides*
      Lamina under 15 cm long ..... 3. *C. alpina*
    Stipe densely setose and scaly.
      Sori dorsal on veinlets.
        Frond tripinnate ..... 4. *C. vilis*
        Frond quinquepinnatifid ..... 5. *C. speciosissima*
      Sori terminal on veinlets ..... 6. *C. pulchra*
Frond bipinnate, stipe brown ..... 7. *C. habbemensis*
Frond hardly bipinnate, stipe black ..... 8. *C. sagenioides*

1. **C. DISSECTA (Forster) Copel.**

C. dissecta (Forster) Copel., Genera (1946) 124.

Clemens 11422, Morobe, alt. ca. 1,000 m; *Bamler R 16,* Rook Island, alt. 100 m. Reported from Dutch New Guinea by van Alderwerelt van Rosenburg, *Lam 682,* alt. 10 m. I would expect it to be common at minor altitudes.

Polynesia and Malaya.

2. **C. HYPOLEPIOIDES (Ros.) Copel.**

C. hypolepioides (Ros.) Copel., Genera (1946) 124.
Dryopteris hypolepioides Ros., Fedde's Repert. **12** (1913) 175.

Keysser B 13 (1912), Bolan Mountains, alt. 3,400–3,800 m, isotype in Herb. Univ. Calif; *Brass 9295*, Lake Habbema, alt. 3,225 m, common floor-fern in subalpine forest. The new collection is far more ample than the type, but identical in hairs, paleae, residual roughness, and in having vestigial indusia—which can be detected on some sori of our isotype.

The rhizome is ascending, the stipes contiguous but not crowded. Stipe 55 cm tall, lamina 80 cm long, lower and medial pinnae 25 cm long, 10 cm wide; larger pinnules 6 cm long, 15 mm wide; secondary pinnules many, free, subpinnate with rounded or somewhat cuneate segments, the sterile ones 1.7 mm long by 1.3 mm wide, the fertile considerably contracted and covered by the sori. Except in stature and consequent dissection, the identity is so complete that I believe this must represent in full development the species of which the type collection is an ill developed form. Endemic.

3. **C. ALPINA (Ros.) Copel.**

C. alpina (Ros.) Copel., Genera (1946) 124.
Dryopteris alpina Ros., Fedde's Repert. **12** (1913) 173.

Keysser B 36, Bolan, alt. 3,600–3,800 m, isotype in Herb. Univ. Calif. This may represent the preceding species, extremely reduced at extreme altitude; if this is the case, the correct name is *C. alpina.*

4. **C. VILIS (Kunze) Ching**

C. vilis (Kunze) Ching, Bull. Fan Bot. **8** (1938) 290.

Schlechter 17792, Ibo Mountains, alt. 1,000 m, received as *Dryopteris intermedia* (Blume) O. K., var. *microloba*, from which (the Mindanao varietal type) it differs only in having more acute segments. It is never the original *C. vilis* than are various specimens ascribed to that species in recent years.

5. **C. SPECIOSISSIMA Copel.** **Plate 13.**

C. speciosissima Copel., Genera (1946) 125.
Dryopteris speciosissima Copel., Univ. Calif. Publ. Bot. **18** (1942) 219.

C. gregis C. vilis quinquepinnatifida; rhizomate erecto, 1–1.5 cm crasso, apice paleis rufis 1 cm longis 1–2 mm latis integris immerso; stipite ca. 75 cm alta, basi nigro-fusco 8 mm crasso, sursum rufo-fusco 4 mm crasso superne trisulcato, ubique paleis

setiformibus atrocastaneis squarrosis 5 mm longis horrido, et paleis aliquot dejectis basibus nigris relictis aspero; lamina 1 m longa, deltoideo-ovata, rhachibus paleis setiformibus et setis, sursum pilis rubidis nigrescentibus vestitis; pinnis oppositis, infimis 35 cm longis, 15 cm latis, acuminatis, pinnula infima acroscopica 6 cm longa, sequente basiscopica 11 cm longa, 3.5 cm lata acuminata bipinnata, pinnulis tertiariis 3 m longis, 1.5–2 mm latis obtusis inferioribus fere ad costam pinnatisectis, segmentis 0.5 mm latis rotundatis herbaceis costis costulisque pilis sparsis deciduis ornatis; venis in segmentis simplicibus, in pinnulis sequentibus integrioribus vel integris pauci-ramosis; soris ad venulas fere basalibus, indusiis fuscis membranaceis mox plicatis, nonnullis orbiculari-reniformibus, aliis ut videtur semiorbicularibus.

Dutch New Guinea: Bele River, alt. 2,200 m, *Brass 11257*, "in forest undergrowth, one large clump on a limestone cliff."

In its deltoid frond and opposite pinnae, this species resembles the Peranema-Diacalpe group of genera. Although very thin, the indusia persist, but are so rolled-up and distorted that it is difficult to be sure of their form.

6. C. PULCHRA Copel. **Plate 14.**

C. pulchra Copel., Genera (1946) 124.
Dryopteris pulchra Copel., Univ. Calif. Publ. Bot. 18 (1942) 219.

Formis dissectis C. vilis similis; rhizomate terrestre, revirepente adscendente, ca. 1 cm crasso, basibusque stipitum paleis atrocastaneis lineari-acicularibus integris 1 cm longis vestitis et furfuraceis; lamina 45 cm alta, deltoideo-ovata, acuminata, basi quadripinnatifida; pinnis infimis ca. 15 cm longis, basi 9 cm latis, basiscopice dilatatis; pinnula infima acroscopica, sequente proxima basiscopica 5.5 cm longa ad costam alatam pinnatisecta segmentis 1 cm longis etiam oblique pinnatisectis segmentis secundariis deltoideo-oblongis obtusis vix 1 mm latis; pinnis sequentibus gradatim angustioribus subsessilibus, oppositis, pinnulis infimis semper basiscopicis ad alam angustam costarum pinnatisectis, segmentis elongato-oblongis plerisque integris membranaceis obscure viridibus glabris, costis pinnularum piluliferis; rhachi frondis conspicue, pinnae inconspicue paleaceis; soris inframarginalibus ad venalas apicalibus, indusiis persistentibus plerisque orbiculari-reniformibus, sororum superiorum interdum athyrioideis.

Dutch New Guinea: 4 km SW. of Bernhard Camp, Idenburg River, alt. 850 m, *Brass 13455*, type; also, *No. 12848*, alt. 1,150 m, frequent on rocks in rain-forest ravines.

In spite of some notable differences, especially in the position of the sori at the ends of the veinlets, this seems to be related to *C. vilis*.

7. **C. HABBEMENSIS** Copel. **Plate 15.**

C. habbemensis Copel., Genera (1946) 124.
Dryopteris habbemensis Copel., Univ. Calif. Publ. Bot. **18** (1942) 216.

C. rhizomate erecto, elongato, 5 mm crasso, nigro, apicem versus basibusque stipitum paleis nigro-fuscis ca. 5 mm longis 1 mm latis acuminatis vestitis; stipitibus fasciculatis, 25 cm altis, 2 mm crassis, fuscis, sursum paleis parvis remotis sparsis et minute pubescentibus rhachi inconspicue velutina fere epaleata; lamina 30 cm alta, 5–9 cm lata, brevi-acuminata, bipinnata; pinnis infimis deflexis, 3.5 cm longis, medialibus 4.5 cm longis, 1 cm latis, acutis basi truncatis sessilibus, rhachillis utraque facie pubescentibus; pinnulis 10–12-paribus, 7 mm longis 2 mm latis, obtusis, plerisque adnatis non confluentibus, infimis sessilibus basi lobatis, ceteris obscure crenatis, glabris, firme papyraceis, superne nigro-viridibus inferne obscure olivaceis; venulis 4–5-paribus, simplicibus, plerisque soriferis; soris medialibus, superficialibus, indusiis orbiculari-reniformibus, fuscis, glabris, persistentibus.

Dutch New Guinea: Lake Habbema, alt. 3,225 m, *Brass 9304*, type, "plentifully scattered over mossy floor of forest; tufts ± 60 cm high." *No. 9217*, same locality, is larger and more lax than the type, the lower pinnules relatively long and narrow, and more deeply cleft or lobed. *No. 11245;* Bele River, alt. 2,300 m, "abundant in openings of ridge forest," is like *No. 9217* except for purplish-black stipes; its suberect caudex is 25–30 cm tall. The type resembles *C. viscosa* in size, shape and color, but is freely bipinnate. This affinity is more unmistakable in the case of *No. 11245;* but specific identity with *C. viscosa* or any of its described forms or relatives, as I understand them, is impossible.

Brass 11895, Idenburg River region, alt. 1,800 m, has the larger pinnae pinnate a third of their length. It is apparently an undescribed relative of *C. viscosa* and *C. habbemensis*.

8. **C. SAGENIOIDES** (Mett.) Copel.

C. sagenioides (Mett.) Copel., Genera (1946) 124.

I mistrust the presence of this species in New Guinea. It is listed by Brause, Engler's Jahrb. **56** (1920) 94, as "var. *Sagenia livida* Mett. msc." *Bamler 103* (1914), received here as *Dryopteris sagenioides*, is *Pteridrys olivacea*.

17. DRYOPOLYSTICHUM Copeland

D. PHAEOSTIGMA (Cesati) Copel.

D. phaeostigma (Cesati) Copel., Genera (1946) 126.
Aspidium phaeostigma Cesati, Rend. Ac. Napoli **16** (1877) 26, 29.
Dryopteris phaeostigma C. Chr., Index (1905) 284; Dansk Bot. Arkiv **9** No. 3 (1937) 47.
D. Kingii Copel., Philip. Jour. Sci. **6** C (1911) 73, *non* C. Chr. (1905)
D. tamatana C. Chr., Suppl. I (1913) 40.
Polystichum lastreoides Ros., Fedde's Repert. **9** (1911) 425.
Dryopteris Ledermanni Brause, Engler's Jahrb. **56** (1920) 90.
D. cyclosorus v.A.v.R., Nova Guinea **14** (1924) 21.

Brass 8839, Hollandia, alt. 50 m; *13855,* alt. 175 m; *1422,* Aisa River. The most named, and one of the most collected New Guinea ferns.

Endemic.

18. PTERIDRYS Christensen and Ching

P. OLIVACEA (Ros.) Copel.

P. olivacea (Ros.) Copel., Genera (1946) 126.
Dryopteris olivacea Ros., Hedwigia **56** (1915) 352.

Sattelberg, alt. 800–900 m, *Bamler 103* of 1914, received by the University of California as *Dryopteris sagenioides.* It differs from *P. microthecia* (Fée) C. Chr. et Ching by having basal pinnae neither enlarged nor dilated, and by having fewer sinuses obstructed by teeth. Endemic.

19. HETEROGONIUM Presl

H. PROFEREOIDES (Christ) Copel.

H. profereoides (Christ) Copel., Univ. Calif. Publ. Bot. **16** (1929) 61.
Aspidium profereoides Christ, Philip. Jour. Sci. **2** C (1907) 156.
A. subaequale Ros., Fedde's Repert. **12** (1913) 176.
Tectaria subaequalis Copel., Philip. Jour. Sci. **9** C (1914) 5.

Known in New Guiea only by Bamler's collection or collections on the Sattelberg. The type of *A. subaequale* was collected in 1912. Our specimen is *Rosenstock, Fil. novog. exsicc. n. 244,* dated April, 1914, labelled "Aspidium subaequale Ros. n. sp." It is less dimorphic than the type collection of *H. profereoides,* but otherwise identical. There is no indusium, and the costal sori are oblong.

Mindanao.

20. STENOSEMIA Presl

S. AURITA (Swartz) Presl

S. aurita (Swartz) Presl, Tent. (1836) 237.

King 235; Brass 5651, Papua. Previously reported.

Solomon Islands to India.

21. TECTARIA Cavanilles

This is a difficult genus, for natural reasons, because many of its species are ill fixed in the degree of dissection of their fronds, and because the indusia are variable and inconstant within some of the species. It is artificially difficult in reflection of the natural difficulties, because its species have been described in a number of unreal genera. Any present treatment of the New Guinea species is somewhat tentative because the collections are not numerous enough to permit final judgment of the local variation within specific limits.

Key to the species

Lamina at least bipinnate at base.
  Pinnules at least pinnatifid.
    Areolae along costae and main veins only.
      Pinnules decrescent upward, or few.
        Indusium present.
          Frond green, clear but dark ..... 1. *T. devexa*
          Frond brownish-green ..... 2. *T. Kingii*
        Sori naked.
          Lamina subcoriaceous ..... 3. *T. andaiensis*
          Lamina thin.
            Rachises scaly ..... 4. *T. ferruginea*
            Rachises puberulous ..... 5. *T. gymnocarpa*
      Pinnules numerous and uniform ..... 6. *T. leuzeana*
    Veins anastomosing freely.
      Sori naked ..... 7. *T. irregularis*
      Indusium present.
        Lamina coriaceous, naked ..... 8. *T. Ledermanni*
        Lamina thin, pubescent ..... 9. *T. pubescens*
  Pinnules not pinnatifid.
    Indusium persistent.
      Fertile suprabasal pinnae pinnatifid ..... 10. *T. cesatiana*
      Fertile suprabasal pinnae crenate ..... 11. *T. Barclayi*
    Indusium fugacious ..... 18. *T. melanocaulis*
Lamina simple to pinnate, not minute.
  Stipe not winged.
    Pinnae normally more than 3 pairs.
      Fronds clustered.
        Sori round.
          Pinnae broad at base.
            Indusium persistent ..... 11. *T. Barclayi*
            Indusium fugacious ..... 19. *T. Weinlandii*
          Pinnae narrow at base.
            Indusium reniform ..... 12. *T. crenata*
            Indusium peltate ..... 13. *T, ternatensis*
        Sori suboblong ..... 14. *T. pleiosora*
        Sori amorphous, exindusiate ..... 15. *T. teratocarpa*

Rhizome elongate, fronds seriate.
Pinnae 3 cm wide, not forked ..... 16. *T. Menyanthidis*
Pinnae 2 cm wide, the lower forked..... 17. *T. semibipinnata*
(Frond simple or with 1 to 3 pinnae)
Frond simple or with 1 to 2 pinnae.
Pinnae pinnatifid ..... 20. *T. pleocnemioides*
Margin broadly crenate ..... 21. *T. novoguineensis*
Margin essentially entire.
Indusium none or inconspicuous.
Sori scattered.
Sori minute, somewhat irregular..... 22. *T. angulata*
Sori irregularly elongate ..... 23. *T. cristovalensis*
Sori in paired rows ..... 24. *T. siifolia*
Indusium conspicuous.
Sori along main veins ..... 12. *T. crenata*
Sori submarginal ..... 25. *T. craspedocarpa*
Rachis and stipe broadly winged.
Sori in paired rows ..... 28. *T. decurrens*
Sori scattered ..... 26. *T. beccariana*
Lamina simple, under 4 cm long ..... 27. *T. minuta*

1. T. DEVEXA (Kunze) Copel.

T. devexa (Kunze) Copel., Philip. Jour. Sci 2 C (1907) 415.

Accredited to New Guinea as *Pleocnemia membranacea* Bedd., var. *novoguineensis* Ros., Fedde's Repert. **10** (1912) 338, listed by Brause, Engler's Jahrb. **56** (1920) 116, *Aspidium devexum,* var. *novoguineensis* Ros. We have this plant, *Rosenstock Fil. novog. exsicc. n. 63.* It is positively not *Aspidium membranaceum* Hooker. It is near *T. gigantea* (Blume) Copel., but hardly identical. It is larger than *T. Kingii,* with broader segments, and is dark-green, not brownish-green. I list *T. devexa* because this plant is not to be listed elsewhere, and I do not wish to describe our specimen as new.

Aspidium devexum Kunze was a *nomen nudum,* a substitute for "*Sagenia intermedia* J. Sm. (*Cuming. Phil. No. 177*),"—also a *nomen nudum,* the more mysterious because 177 was not a Cuming collection number, the plant having none. I construe it by *Aspidium membranaceum* Hooker, Sp. Fil. V 105.

2. T. KINGII Copel.

T. Kingii Copel., Philip. Jour. Sci. **9** C (1914) 4.

Known only by the original collection, *King 402,* from Woodlark Island.

3. T. ANDAIENSIS (Baker) C. Chr.

T. andaiensis (Baker) C. Chr., Suppl. III (1934) 177; see Dansk Bot. Arkiv **9** No. 3 (1937) 49.

Known only by the original collection, *Herb. Beccari No. 12697.*

4. T. FERRUGINEA (Mett.) Copel.

T. ferruginea (Mett.) Copel., Philip. Jour. Sci. 6 C (1911) 76.

Brass 8832, Hollandia, alt. 50 m.

Described from a collection by Zippelius. *King 264,* from Papua, fits Mettenius' description, but differs from his figure in being somewhat more dissected.

Endemic.

5. T. GYMNOCARPA Copel.

T. gymnocarpa Copel., Philip. Jour. Sci. 9 C (1914) 4.

Known only by the original collection, *King 401,* from Loana, Papua. Christensen reduces this to *T. ferruginea,* calling my attention to Mettenius' figure. There are resemblance and affinity; but *King 401* and *264* differ essentially in paleae and hairs, carefully described in Mettenius' text, but omitted on his illustration.

6. T. LEUZEANA (Gaud.) Copel.

T. leuzeana (Gaud.) Copel., Philip. Jour. Sci. 2 C (1907) 417.

Brass 12938, alt. 1,200 m; *13857,* alt. 130 m.

Common but variable. Rosenstock has described varieties *echinocarpa* and *lobato-crenata;* and a Winkler collection received from Rosenstock as *Aspidium chrysotrichum* Baker, var. can be included here. However, more than one distinct species may already be included.

Polynesia to Asia.

7. T. IRREGULARIS (Presl) Copel.

T. irregularis (Presl) Copel., Philip. Jour. Sci. 2 C (1907) 416.

Common. Fiji to Asia.

8. T. LEDERMANNI (Brause) C. Chr.

T. Ledermanni (Brause) C. Chr., Suppl. III (1934) 181.

Not seen; known only by the original collection, *Ledermann 9409,* from the Sepik region, alt. 850 m.

9. T. PUBESCENS Copel. **Plate 16.**

T. pubescens Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

Rhizomate et parte inferiore stipitis ignotis; stipite 4 mm crasso, facie anteriore trisulcato, brunneo-pupurascente, rhachibusque pilis minutis articulatis debilibus sat dense pubescentibus;

lamina ultra 50 cm longa, deltoideo-ovata, basi imo tripinnata; pinnis infimis fere 30 cm longis, pinna infima basiscopica 12 cm longa, ad alam apicem versus latam deorsum contractam pinnatifida, pinnula secundaria libera una, segmentis sequentibus pinnatifide lobatis 13 mm latis, lobis 3–4 mm latis obtusis; pinnis sequentibus 20 cm longis, vix obliquis, deorsum leviter bipinnatifidis; pinnis superioribus pinnatifide lobatis, deinde in apicem sat magnum coadunatis; lamina herbacea, utraque facie pubescente; venis laxe anastomosantibus, utroque latere costae segmenti seriem unam areolarum majorum et hic illuc seriem alteram minorum includentibus; soris parvis irregulariter seriatis, medialibus, aut ad apices venularum inclusarum aut apices versus loborum omnino liberarum, indusio typi persistente, plerumque cordato rarius peltato, glabro.

King 359, Lakekamu, Papua, type,—reported, Philip. Jour. Sci. **6** C (1911) 76, as *T. malayensis;* also, *Bamler, Rosenstock Fil. novog. exsicc. n. 236,* received as *Aspidium coadunatum* Wall. var. *rufovillosa* Ros. *n. v.,* from Logaueng, Kaiser-Wilhelmsland.

A relative of *T. ferruginea,* less dissected, and therefore with more areolae, and indusiate. The Bamler plant is old, and but few indusia can be detected. On the type, but not on the Bamler plant, there are a few narrowly linear paleae 1–5 mm long on the rachises.

As the specimens cited as *T. pubescens* are the only bases for reports of *T. malayensis* and *T. coadunata* in New Guinea, these two species are dropped from the list of of New Guinea ferns.

10. T. CESATIANA (C. Chr.) Copel.

T. cesatiana (C. Chr.) Copel., Philip. Jour. Sci. **6** C (1911) 76.
Aspidium bamlerianum Ros., Fedde's Repert. **10** (1912) 330.
Tectaria bamleriana C. Chr., Suppl. III (1934) 177.

Brass 13408, alt. 850 m, largest frond 13 cm long, subpinnate; *No. 13442,* alt. 800 m, largest frond 43 cm long, tripinnatifid at base; *No. 13852,* alt. 170 m, up to 50 cm long. More or less dimorphic, usually conspicuously so.

Our specimen of *A. bamlerianum,* received from Rosenstock, and bearing his notation "unicum," is exactly this species.

Throughout New Guinea. Endemic.

11. T. BARCLAYI (Carr.) C. Chr.

T. Barclayi (Carr.) C. Chr., Suppl. III (1934) 177.

Carr 11042, 11145, 12334, det. et misit Alston. *Brass 3648* and *5572,* from Papua, det. Christensen as *T. papuana* Copel.,

are this species. The type of *T. papuana* looks distinct, the margin being entire to crenate, the intermediate pinnae broadly rounded at base and not at all pronged; but, so variable in dissection are the species of this genus, it may be only an undissected form. *T. Barclayi* shows affinity to *T. crenata,* which the type of *T. papuana* does not suggest.

New Ireland.

12. **T. CRENATA** Cav.

T. crenata Cav., Descr. (1802) 250.

Brass 12222, alt. 1,800 m; *No. 13834,* deltoid and trifid. In most genera, the latter specimen would be accepted without question as specifically distinct, but even great differences in form and dissection are not by themselves safe criteria in *Tectaria.* Conspecific with this specimen is *Bamler 14* of 1913, received from Rosenstock as *Aspidium grandifolium* Presl, which it is not; it has free, unforked basal pinnae and one pair of almost free lateral pinnae. These specimens may represent a distinct species, but are at any rate near *T. crenata.*

Common. Asia to Polynesia.

13. **T. TERNATENSIS** v.A.v.R.

T. ternatensis v.A.v.R., Bull. Dept. Agric. Ind. Néerl. No. 18 (1908) 9.

Reported by van Alderwerelt, Nova Guinea **14** (1924) 8.

Distinguished by its author from *Aspidium repandum* Willd. by size and by narrower pinnae; from *A. persoriferum* Copel. and *A. pachyphyllum* Kunze by the shape of the indusium. These are all regarded as forms of *T. crenata,* and any real distinction of *A.* or *T. ternatensis* is not evident.

14. **T. PLEIOSORA** (v.A.v.R.) C. Chr.

T. pleiosora (v.A.v.R.) C. Chr., Gardens' Bull. 7 (1934) 260.

To be distinguished from *T. crenata* by having at least a part of the sori oblong instead of round, and fewer, broader pinnae, broader particularly on the basiscopic side. Regarding *T. crenata* as a freely variable species, I mistrust the distinctions. I have seen no New Guinea specimen, but have an authentic one from Borneo.

15. **T. TERATOCARPA** (v.A.v.R.) C. Chr.

T. teratocarpa (v.A.v.R.) C. Chr., Suppl. III (1934) 185.

Known only by the original collection, *Lam 966,* from the Mamberamo River, alt. 100 m; isotype in Herb. Univ. California.

16. T. MENYANTHIDIS (Presl) Copel.

T. Menyanthidis (Presl) Copel., Philip. Jour. Sci. 2 C (1907) 414.

Brass 13860, alt. 150 m; *King 169, 180; Brass 975;* apparently common.

Philippines; Admiralty and Solomon Islands.

17. T. SEMIBIPINNATA (Wall.) Copel.

T. semibipinnata (Wall.) Copel., Sarawak Mus. Jour. 2 (1917) 371.

What is reported from New Guinea is *Aspidium nudum* (Baker) Diels, said to be a synonym of *T. semibipinnata,* its type from Borneo. The resemblance to *T. Menyanthidis* is so close that confusion is possible.

18. T. MELANOCAULIS (Blume) Copel.

T. melanocaulis (Blume) Copel., Philip. Jour. Sci. 2 C (1907) 416.

Our only New Guinea specimen is *Bamler, Rosenstock Fil. novog. exsicc. n. 117,* from Wareo, alt. 600 m.

Malaya; Philippines; reported from China.

19. T. WEINLANDII (Christ) Copel.

T. Weinlandii (Christ) Copel., Jour. Arnold Arb. 10 (1929) 177.

Central and Eastern New Guinea, at minor altitudes. Endemic.

20. T. PLEOCNEMIOIDES (v.A.v.R.) C. Chr.

T. pleocnemioides (v.A.v.R.) C. Chr., Suppl. III (1934) 183.

Known only by the type collection, *Lam 423,* Mamberamo River, alt. 25 m.

21. T. NOVOGUINEENSIS (Ros.) C. Chr.

T. novoguineensis (Ros.) C. Chr., Suppl. III (1934) 182.

Known only by an old collection by Zippelius in the Rijks Herbarium, Leiden, very imperfectly described: "Ab *Aspidium Labrusca* Christ stipitibus pilosis, laminis grosse crenatis, indusio magno, persistente diversum."

22. T. ANGULATA (Willd.) Copel.

T. angulata (Willd.) Copel., Sarawak Mus. Jour. 2 (1917) 370.

Brass 8836, Hollandia, alt. 50 m. Previously collected by Schlechter and Bamler.

Malaya; Philippines; Solomon Islands.

23. T. CRISTOVALENSIS (C. Chr.) Alston

T. cristovalensis (C. Chr.) Alston, Jour. Bot. (1939) 290.

Brass 13858, Idenburg River, alt. 80 m. Reported from New Guinea as *Dictyopteris pentaphylla* v.A.v.R., *Aspidium quinque-*

foliolatum C. Chr., *Campylogramma pteridiformis* v.A.v.R., and *Tectaria diversisora* Copel.

Solomon Islands. First named *Gymnogramme palmata* Baker.

24. T. SIIFOLIA (Willd.) Copel.

T. siifolia (Willd.) Copel., Philip. Jour. Sci. 2 C (1907) 414.

Reported from New Guinea, but I have not seen it.

Malaya; Philippines.

25. T. CRASPEDOSORA Copel.

T. craspedosora Copel., Jour. Arnold Arb. **10** (1929) 178.

Known only by the type collection, *Brass 557,* Laloki River, alt. 1,500 feet.

26. T. BECCARIANA (Cesati) C. Chr.

T. beccariana (Cesati) C. Chr., Suppl. III (1934) 177; see Dansk Bot. Arkiv. **9** No. 3 (1937) 51.

Polypodium ingens Brause, *teste* Christensen, l. c.

Aspidium vastum Blume *forma latius* v.A.v.R., Nova Guinea **14** (1924) 7. *T. vasta* (Blume) Copel., is otherwise unreported from New Guinea.

Mindanao, as *T. Bryanti* Copel.

27. T. MINUTA Copel.

T. minuta Copel., Philip. Jour. Sci. **30** (1926) 328.

Known only by the type collection, *King 493,* 1. Rev. P. C. Shaw, Mountains behind Taupota.

28. T. DECURRENS (Presl) Copel.

T. decurrens (Presl) Copel., Elmer's Leaflets Philip. Bot. **1** (1907) 234.

Brass 12899, 13854, 13855 A, 13853. The last, a single plant, has simple fronds, entire or broadly and irregularly crenate, attenuate to a short, scaly stipe. Found with typical plants of the species, *Nos. 13854* and *13855 A,* it may be regarded with confidence as an abnormal, or probably juvenile, individual. Our specimen of *Lam 1323,* Doorman River, alt. 200 m, reported, Nova Guinea **14** (1924) 13, as approximately *Dictyopteris heterosora* (Baker) Bedd., is *T. decurrens.*

Common. Polynesia to India.

22. HEMIGRAMMA Christ

H. HOLLRUNGII (Kuhn) Copel.

H. Hollrungii (Kuhn) Copel., Philip. Jour. Sci. **37** (1928) 406.

Besides the original collection, Brause cites *Ledermann 6562, 7781.* This species was described as having pinnatifid fronds.

To it, Christensen, Suppl. III 109, reduces *H. grandifolia* Copel., with pinnate sterile frond, the rachis mostly wingless. This may be correct, as *Hemigramma* is a recent derivative of *Tectaria* with pinnate fronds, and reversions by species with condensed, even with simple and entire fronds, are known to occur. *H. grandifolia* looks like the most primitive element in its genus. The range of the genus is to Java, China and Formosa; and it is in harmony with my theory as to the direction of migration in this region that the most primitive member of a genus with this range should be found in New Guinea. The type of *H. grandifolia* is *King 328*, from Lakekamu, Papua.

New Britain.

23. LASTREA Bory

Key to the species

Frond tripinnatifid at base or more compound.
  Rachises and costae not scaly.
    Stipe smooth ..... 58. *L. setosa*
    Stipe muricate ..... 59. *L. armata*
  Rachises bearing scales and hairs ..... 60. *L. leucolepis*
Frond bipinnate.
  Pinnae freely pinnate.
    Frond not over 60 cm long.
      Sori submarginal ..... 2. *L. bipinnata*
      Sori costular ..... 7. *L. conterminoides*
    Frond several meters long ..... 1. *L. marattioides*
  Free pinnules only about 3 pairs ..... 3. *L. platyptera*
Pinnae pinnate at base only or not at all.
  Veinlets typically forked ..... 4. *L. flavo-virens*
  Veinlets simple.
    Lower pinnae gradually dwarfed.
      Largest pinnae under 5 cm long.
        Rachis sparsely hairy or naked.
          Rhizome creeping, slender ..... 5. *L. Beddomei*
          Stem erect, stouter ..... 6. *L. Brassii*
        Rachis persistently pubescent.
          Pinnae deeply pinnatifid.
            Sori subcostular ..... 7. *L. conterminoides*
            Sori medial ..... 8. *L. perpubescens*
          Pinnae shallowly pinnatifid ..... 9. *L. petrophila*
      Pinnae 10 cm or more long ..... 10. *L. Harveyi*
    Lower pinnae abruptly reduced.
      Lower pinnae over 20 cm long.
        Pinnae cut to 1 mm from costa ..... 11. *L. subattenuata*
        Pinnae pectinate to a broad wing..... 12. *L. pseudostenobasis*
      Pinnae about 15 cm long ..... 13. *L. Regis*
      Larger pinnae 7–10 cm long.

Chartaceous, glabrous beneath ..... 14. *L. novoguineensis*
Herbaceous, glandular beneath ..... 15. *Dryopteris glaucescens*

Pinnae under 5 cm long.
Rachis minutely pubescent ..... 16. *L. Finisterrae*
Rachis hairy and scaly ..... 17. *L. mixta*

Lower pinnae not or but little reduced.
Stipe reddish or purplish-black.
Rachis hairy and paleate.
Lamina pallid, indusia purplish ..... 18. *L. pallescens*
Lamina dark, indusia brown.
Sori about medial ..... 19. *L. viscosa*
Sori nearer the costule.
Papyraceous ..... 20. *L. engleriana*
Coriaceous ..... 21. *Dryopteris villosipes*
Rachis hairy, not scaly.
Membranaceous, diaphanous ..... 22. *L. diaphana*
Thin-chartaceous or herbaceous.
Indusium naked ..... 23. *L. subnigra*
Indusium glandular-puberulent..... 24. *Dryopteris oligolepia*
Coriaceous ..... 25. *L. coriacea*
Stipe stramineous to brown.
Sori exindusiate, elongate ..... 26. *Dryopteris stellatopillosa*
Sori exindusiate, round.
Sori about medial.
Veinlets not connivent ..... 27. *L. wariensis*
Lowest veinlets connivent ..... 47. *L. subdimorpha*
Sori nearer to costule.
Sporangia naked.
Stipe not scaly ..... 28. *L. tuberculata*
Stipe scaly at base.
Pinnae up to 5 cm wide..... 29. *L. notabilis*
Pinnae under 3 cm wide.
Paleae nigrescent ..... 30. *L. dryopteroidea*
Basal paleae brown ..... 31. *L. varievestita*
Sporangia setose.
Lamina 70 cm long ..... 32. *L. alta*
Lamina up to 35 cm long.
Pinnae broad-lanceolate ..... 33. *L. quadriaurita*
Pinnae narrow-lanceolate ..... 34. *L. ensipinna*
Sori indusiate.
Sori supra-medial to marginal.
Indusium not hairy ..... 36. *L. immersa*
Indusium hairy.
Hairs of rachis various ..... 35. *Dryopteris quadriquetra*
Hairs of rachis uniform.
Pinnae 4 cm wide ..... 37. *L. keysseriana*
(Pinnae up to 2 cm wide)
Pinnae up to 2 cm wide.

Basal pinnae horizontal..... 38. *L. obliquata*
Basal pinnae deflexed..... 39. *Dryopteris Peekeli*
Sori medial.
Frond thin.
Stipe scaly at base only..... 40. *L. gracilescens*
Stipe subscaly upward..... 41. *L. Lauterbachii*
Frond coriaceous.
Segments 1–2 mm wide..... 42. *Dryopteris stereophylla*
Segments 3 mm wide.
Rachis naked beneath..... 43. *Dryopteris rigidifolia*
Rachis hairy ..... 44. *Dryopteris horizontalis*
Sori inframedial to costular.
Lamina thin.
Rachis hairy ..... 45. *L. calcarata*
Rachis naked beneath..... 46. *L. fulgens*
Lamina firm to coriaceous.
Indusium setulose.
Rachis pubescent only..... 48. *L. falcatipinnula*
Rachis hairy and scaly.
Pinnae 15 mm wide..... 49. *L. echinata*
Pinnae 3 cm wide..... 50. *L. belensis*
Indusium naked.
Pectinate pinnae many.
Segments 5 mm wide..... 51. *L. costulisora*
Segments 3 mm wide..... 52. *L. chlamydophora*
Pinnae up to 10 pairs.
Rachis pubescent.
Pinnae coriaceous ..... 53. *L. ophiura*
Pinnae subcoriaceous ..... 54. *L. crassa*
Rachis naked beneath ..... 55. *L. wantotensis*
Pinnae nearly or quite entire..... 56. *L. nephrolepioides*
Frond pinnatifid except for basal pinnae ..... 57. *L. hunsteiniona*

1. **L. MARATTIOIDES (Alston) Copel.**

Dryopteris marattioides Alston, Jour. of Bot. 78 (1940) 227; Nova Guinea N. S. 4 (1940) 110, *Pl. 7, f. 7, 8.*

Clemens 4809, type, Morobe, alt. 5,800 feet; *6808,* Sambanga, alt. 6,000 feet. Twelve to 14 feet tall. Mrs. Clemens made yet a third collection of this remarkable fern, which may well represent an undescribed genus.

Endemic.

2. **L. BIPINNATA Copel., comb. nov.**

Dryopteris bipinnata Copel., Philip. Jour. Sci. 9 C (1914) 2.

Known only by the type collection, *King 407,* from Loane, Papua.

3. L. PLATYPTERA Copel. **Plate 17.**

L. platyptera Copel., Genera (1946) 139.
Dryopteris platyptera Copel., Univ. Calif. Publ. Bot. **18** (1942) 219.

Rhizomate erecto, basibusque confertis stipitum paleis ovatis acutis integris glabris fuscis nigrescentibus ca. 1 mm longis vestitis; stipite alibi glabro atropurpureo nitente; lamina 30 cm longa, 11 cm lata, sensim acuminata, basi vix angustata, rhachi atropurpurea costisque superne purpureostrigosis, alibi laminaque glabris; pinnis ca. 13-paribus, inferioribus breviter (1 mm) pedicellatis, infimis paullo abbreviatis vix deflexis, sequentibus ca. 5.5 cm longis 2 cm latis, acuminatis, infra apicem integrum gradatim profundius pinnatifidis, rhachin versus pinnatis; pinnulis ca. 3-paribus, adnatis vel infimis sessilibus, infima acroscopica inciso-dentata, sequentibus obscure serratis ca. 11 mm longis, 2–3 mm latis, acutis vel obtusis, herbaceis; venis ca. 6-paribus, infimis saepe furcatis ceteris simplicibus; soris inframedialibus, parvis, indusiis tenuibus, nudis, deciduis.

Dutch New Guinea: Bele River, alt. 2,200 m, *Brass 11328;* "in semi-shade on high rocky bank of stream."

Apparently related to *L. pyrrhorhachis,* and with resemblance but no probable affinity to *Ctenitis sagenioides* and *Lastrea viscosa.*

4. L. FLAVO-VIRENS (Ros.) Copel.

L. flavo-virens (Ros.) Copel., Genera (1946) 138.
Dryopteris flavo-virens Ros., Fedde's Repert. **10** (1912) 334.

Bamler, Rosenstock Fil. novog. exsicc. n. 118, Wareo, alt. 600 m; isotype in Herb. Univ. Calif. Peculiar in *Lastrea* because of many forked veinlets.

5. L. BEDDOMEI (Baker) Bedd.

L. Beddomei (Baker) Bedd., Ferns Brit. India Corr. II (1870).

Brass 9319, 10888, 10932, alt. 2,620–3,225 m; reported by Gepp from the Arfak Mountains, alt. 7,000 feet.

The Brass specimens are identical with those from Java, Luzon, Formosa and Yunnan. Stipe and rachis rather deciduously hairy, hairs more persistent on minor axes; sori submarginal, indusia glandular or glandular-marginate, transient. The typical plant may be represented by Beddome, Ferns of Southern India, Plate CX, figured with a more hairy rachis, and described as with glabrous indusium. Baker, in publishing the specific name, Syn. Fil. (1873) 267, cited *Thwaites C. P. 1287,* but did not mention the rachis or indusium.

6. L. BRASSII Copel., comb. nov.

Dryopteris Brassii C. Chr., Brittonia 2 (1937) 295.

Brass 4937, Mt. Tafa, alt. 2,400 m. A young frond of the isotype in Herb. N. Y. Bot. Garden bears glandular-marginate indusia, wanting on older fronds. It still seems distinguishable from the preceding species by its erect, scaly rhizome. The creeping rhizome of *L. Beddomei* is characteristic. But *L. Brassii* grew on the "banks of a small stream flowing over debris of a landslip." If an established plant grew up through any kind of a subsequent deposit, its rhizome would almost have to become erect, for the occasion.

7. L. CONTERMINOIDES Copel., comb. nov.

Dryopteris conterminoides C. Chr., Index (1905) 258.
Nephrodium simulans Baker, Jour. Bot. 28 (1890) 106, *non* (1874) *nec* (1888).

Known only by the original collection by MacGregor, on Mt. Knutsford. Described as with densely crinite rachis, subcostal sori, and persistent indusium.

8. L. PERPUBESCENS (Alston) Copel., comb. nov.

Dryopteris perpubescens Alston, Jour. Bot. 78 (1940) 227; Nova Guinea N. S. 4 (1940) 111, *Pl. 8, f. 9, 10.*

Clemens 7902c, Morobe District, Kalasa, alt. 1,600 feet. Not seen. Stipe densely puberulous, lamina densely short-pubescent, sori medial, indusia hirsute.

9. L. PETROPHILA Copel. Plate 18.

L. petrophila Copel., Genera (1946) 139.
Dryopteris petrophila Copel., Univ. Calif. Publ. Bot. 18 (1942) 220.

L. rhizomate suberecto, frondibusque, circinnatis paleis fuscis vix 1 mm longis protectis; stipitibus laxe fasciculatis, 5–7 cm altis, gracilibus, brunnescentibus, basi paleis paucis cito caducis fere 2 mm longis ovatis sparsis, mox omnino glabris; lamina 40 cm longa, parte tertia superiore longe attenuata pinnatifida vel apicem versus tantum inciso-serrata, parte tertia inferiore etiam angustata pinnis decrescentibus remotis infimis minutis, parte mediale usque ad 7.5 cm lata subbipinnatisecta, rhachi minute pallide velutino-pubescente; pinnis suboppositis, sessilibus, maximis 4 cm longis 8 mm latis, acutis, basi acroscopice inconspicue auctis, plus minus medio ad costam inciso-lobatis, superne saturate viridibus, costis costulisque minutissime setulosis, inferne pallidis fere (oculo nudo, omnino) glabris; venis

simplicibus, infimis ad sinus conniventibus rarius confluentibus; soris medialibus infimis inframedialibus, plerisque nudis, rarius indusiis vestigialibus fugacibus praeditis.

Dutch New Gunea: Bele River, alt. 2,200 m, *Brass 11326,* "abundant on moist rock faces along a forest stream; fronds spreading."

With *L. Brassii,* this species belongs in a group more diversely developed in the Philippines than, so far as now known, in New Guinea. From its neighbors in this enumeration, it is distinguishable by the shallowly cut pinnae, with consequent occasional anastomosis of the lowest veinlets. *L. nephrolepioides,* with practically entire pinnae, is also a relative.

10. L. HARVEYI Carr.

L. Harveyi Carr., Flora Vitiensis (1873) 359.

Listed from New Guinea by Brause, but not known to me here. Described from Fiji; reported elsewhere in Polynesia, and from the New Hebrides and Admiralty Islands.

11. L. SUBATTENUATA (Ros.) Copel.

L. subattenuata (Ros.) Copel., Genera (1946) 1940.
Dryopteris subattenuata Ros., Fedde's Repert. **10** (1912) 332.

Known only by the original collection, *Bamler L 37, Rosenstock Fil. novog. exsicc. n. 80,* from Logaueng, alt. 300 m; isotype in Herb. Univ. Calif.

12. L. PSEUDOSTENOBASIS Copel.

Dryopteris pseudostenobasis Copel., Jour. Arnold Arb. **10** (1929) 176.

Brass 1000, Ihu, Vailala River; known by the single collection; possibly a form of *Cyclosorus alatellus.*

13. L. REGIS Copel. **Plate 19.**

L. Regis Copel., Genera (1946) 140.
Dryopteris Regis Copel., Univ. Calif. Publ. Bot. **18** (1942) 220.

L. rhizomate et stipite ignotis; frondis parte visa 120 cm longa, deorwum abrupte contracta, pinnis hic 4–4.5 cm inter se distantibus 6-paribus visis, 1–1.5 cm longis, orbiculari-ovatis rotundatis, lobatis vel pinnatifidis segmentis ca. biparibus 4 mm latis, rhachi 5 mm crassa fusco-plumbeo nudo; pinnis sequentibus permultis oppositis, 3–4 cm remotis, sessilibus et tuberculis subtensis, ca. 15 cm longis, 2.5 cm latis, acuminatis, basi paullo dilatatis, ad alam 1 mm latam costae suboblique pectinatis, costis superne velutinis inferne glabris; segmentis ca. 13 mm longis 4 mm latis, rotundatis, integris, papyraceis, glabris;

venis ca. 8-paribus, simplicibus, infimis ad marginem supra sinum currentibus; soris multis, parvis, subcostularibus, indusiis invisis, sporangiis in vetustat enudis.

Papua: Mountains behind Medan, *Rev. Copland King 486.*

The specimen consists of 120 cm of the upper part of a frond, wanting the base. The absence of an indusium may be due to age.

13a. DRYOPTERIS MUNDA Ros.

Dryopteris munda Ros. Meded. Rijks Herb. No. 31 (1917) 5.

"Nova Guinea: Atasrip 1903." Not seen. So far as the very incomplete description shows, this may resemble *L. Regis* except for having hairy axes.

14. L. NOVOGUINEENSIS (Brause) Copel.

L. novoguineensis (Brause) Copel., Genera (1946) 139.
Dryopteris novoguineensis Brause, Engler's Jahrb. **49** (1912) 26.

Brass 12849, alt. 1,200 m. The type is *Schlechter 17719,* Kani Mountains, alt. 100 m. *Bamler, Rosenstock Fil. novog. exsicc. n. 227,* distributed as this species, fits better the description of *Dryopteris glaucescens.*

Endemic.

15. DRYOPTERIS GLAUCESCENS Brause.

Dryopteris glaucescens Brause, Engler's Jahrb. **56** (1920) 85.

Sepik region, alt. 1,400–1,500 m, *Ledermann 13034.*

This and the preceding species seem to be very similar.

16. L. FINISTERRAE (Brause) Copel.

L. Finisterrae (Brause) Copel., Genera (1946) 138.
Dryopteris Finisterrae Brause, Engler's Jahrb. **49** (1912) 20.

Schlechter 18134, Finisterre Mountains, alt. 1,000 m; *Bamler 116* (1914), Sattelberg.

Endemic.

17. L. MIXTA (Ros.) Copel., comb. nov.

Dryopteris mixta Ros., Fedde's Repert. **12** (1913) 172.

Known only by the type collection, *Keysser S 141,* Sattelberg, alt. 800–1,000 m; not seen.

18. L. PALLESCENS (Brause) Copel., comb. nov.

Dryopteris pallescens Brause, Engler's Jahrb. **56** (1920) 88.

Known only by the type, *Ledermann 9146,* Sepik region, alt. 850 m; not seen. Two meters tall.

19. L. VISCOSA J. Smith

L. viscosa J. Smith, Jour. Bot. **3** (1841) 412 *nomen.*
Nephrodium viscosum Baker, Syn. Fil. (1867) 264.

Brass 13294, alt. 900 m, common ground fern in *Agathis* forest. Except that few glands can be detected, this is perfectly typical.

Philippines; Borneo; and (not quite typical) Fiji.

This is a variable species or a closely related group. Christensen has reduced to it two which seemed distinct species to me; and they are indeed reducible if one construe it broadly. If this policy be adopted, I mistrust the specific identity of all of the following six "species."

20. L. ENGLERIANA (Brause) Copel.

L. engleriana (Brause) Copel., Genera (1946) 138.
Dryopteris engleriana Brause, Engler's Jahrb. **49** (1912) 19.

The type, not seen, is *Schultze 330,* from the Sepik region. We have received with this name *Keysser 181,* Sattelberg Hinterland; also, as var. *hirta* C. Chr., Brittonia **2** (1937) 296, *Brass 5032* and *4104. Brass 10281,* Lake Habbema, alt. 2,800 matches these well. All have persistent indusia; the species was described as exindusiate. They are also alike in having nigrescent stipe-bases, not provided in the description.

21. DRYOPTERIS VILLOSIPES Gepp.

Dryopteris villosipes Gepp. in Gibbs, Dutch N. W. New Guinea (1917) 70.

Gibbs 5627, Arfak Mountains, alt. 7,000–8,000 feet; not seen. Epiphytic. Without other comparison, Gepp remarks: "The plant differs in every respect from *D. viscosa.*

22. L. DIAPHANA (Brause) Copel., comb. nov.

Dryopteris diaphana Brause, Engler's Jahrb. **56** (1920) 80.

Ledermann 8903, Sepik region, alt. 850 m; collected but once.

23. L. SUBNIGRA (Brause) Copel.

L. subnigra (Brause) Copel., Genera (1946) 140.
Dryopteris subnigra Brause, Engler's Jahrb. **56** (1920) 82.

Ledermann 11962, type, not seen, Sepik region, alt. 2,170 m, epiphytic in masses of moss; *Clemens 41020,* Morobe, alt. 1,800 m. *Brass 12038,* alt. 1,750 m, a single specimen, epiphytic with pendent fronds, is like *L. subnigra* in most respects, but the nether surface is minutely pubescent.

24. DRYOPTERS OLIGOLEPIA v.A.v.R.

Dryopteris oligolepia v.A.v.R., Nova Guinea **14** (1924) 17.

Typified by *Lam 1977,* Doorman-top, alt. 2,520 m, epiphytic; not seen. Because of relative nakedness of stipe and rachis, *Brass 9062,* Lake Habbema, alt. 3,225 m, may be identified as this species.

Between *L. subnigra* and *D. oligolepia,* there are differences in description which may be diagnostic of species. Thus, the paleae are described as "grosse dentatis" on the former, "integerrimis" on the latter. On *Brass 9062,* they are mostly entire, but a few have marginal outgrowths. The indusium of the former is "glabrum," of the latter "in juventute minutissime glanduloso-puberulum." Some globose unicellular glands can be detected on the margin of the indusium of the Brass plant. I do not suppose that the differences are real, but have not been an authentic specimen of either species.

25. L. CORIACEA (Brause) Copel., comb. nov.

Dryopteris coriacea Brause, Engler's Jahrb. **56** (1920) 83.

Known only by Ledermann's collections from the Sepik region, *No. 10965,* alt. 1,350 m (type), and *No. 11291,* alt. 1,300 m (var. *elata*).

25a. L. KLOSSII Ridley

L. Klossii Ridley, Trans. Linn. Soc. Bot. **9** (1916) 257.

Carstenz Expedition, alt. 5,500 feet.

This may be an older name for *L. subnigra,* but the description is inadequate for its recognition.

L. erubescens (Wall.) Copel. is reported by Ridley in the paper just cited; it is otherwise unknown in New Guinea.

26. L. STELLATO-PILOSA (Brause) Copel., comb. nov.

Dryopteris stellato-pilosa Brause, Engler's Jahrb. **56** (1920) 96.

Known only by the type collection, *Schlechter 16853,* Mt. Gati, alt. 600 m. It is a small *Leptogramma,* having few elongate naked sori.

27. L. WARIENSIS Copel.

L. wariensis Copel., Genera (1946) 140.
Dryopteris wariensis Copel., Philip. Jour. Sci. **6** C (1911) 73.

Collected only once,—*King s. n.,* Waria River, Papua.

28. L. TUBERCULATA (Ces.) Copel.

L. tuberculata (Ces.) Copel., Genera (1946) 140.
Nephrodium tuberculatum Cesati, Atti Acad. Napoli **7** (1877) 29; see C. Chr., Dansk Bot. Arkiv **9** No. 3 (1937) 48.
Dryopteris Schlechteri Brause, Engler's Jahrb. **49** (1912) 16, *f. 1 E.*
Dryopteris schizophylla v.A.v.R., Nova Guinea **14** (1924) 19.

Brass 13656, alt. 700 m; *13835,* alt. 150 m; *Schlechter 16188,* type of *D. Schlechteri,* Kelel, alt., 200 m; *16811,* var. *djamuensis* Brause, Djamu, alt. 350 m, isotypes in Herb. Univ. Calif.; *Lam 1185, 1296,* cotypes of *D. schizophylla,* of which the type, not

seen, is *Lam 772*. Remarkable for the absence of permanent paleae on the base of the stipe.

Endemic.

29. L. NOTABILIS (Brause) Copel.

L. notabilis (Brause) Copel., Genera (1946) 139.
Dryopteris notabilis Brause, Engler's Jahrb. **56** (1920) 91.

Ledermann 11663 and *14991*, Sepik region, alt. 2,070 m, not seen. *Brass 11233*, alt. 2,200 m, is referable to this species. The stipe has a densely scaly base, conforming to Brause's German text, and is elsewhere aculeate, conforming to the Latin. The largest pinna is 30 cm long, 6.5 cm wide.

Endemic.

30. L. DRYOPTEROIDEA (Brause) Copel.

L. dryopteroidea (Brause) Copel., Genera (1946) 138.
Alsophila dryopteroidea Brause, Engler's Jahrb. **56** (1920) 70.
Cyathea atrispora Domin, Acta Bohem. **9** (1930) 95.
Dryopteris atrispora C. Chr., Brittonia **2** (1937) 296.

Brass 10931, Lake Habbema, alt. 2,800 m, "Small tree-fern, trunk 70 cm tall, 6 cm in diameter; fronds few, ± 1.5 m long." The type, not seen, is *Ledermann 11897*, Sepik region, alt. 2,070 m. Brass' specimen conforms to the incomplete description. Its stipe is 65 cm long, sharply aculeate throughout, with black mostly curved spines, densely clothed in the lower part with narrow, chestnut-black, mostly appressed scales up to 1 cm long; sporangia naked. Like Brause, I have detected a sporangium with the annulus passing the pedicel; but it is exceptional practically all being of the polypodioid type.

Endemic.

31. L. VARIEVESTITA (C. Chr.) Copel.

L. varievestita (C. Chr.) Copel., Genera (1946) 140.
Dryopteris atrispora var. *varievestita* C. Chr., Brittonia **2** (1937) 296.

Brass 4996, Mt. Tafa, Central Division, Papua, alt. 2,400 m, in Herb. N. Y. Bot. Garden. As noted by Christensen, this is distinguished by the trichomes of the frond, and by not having veinlets connivent at the sinuses. The complete frond of *L. dryopteroidea* reveals more conspicuous differences, the stipe being much more spiny, and bearing on the lower part denser, narrower and much darker paleae.

32. L. ALTA (Brause) Copel., comb. nov.

Dryopteris alta Brause, Engler's Jahrb. **56** (1920) 86.

Ledermann 11497, Sepik region, alt. 1,300 m; otherwise unknown.

33. L. QUADRIAURITA (Christ) Copel.

L. quadriaurita (Christ) Copel., Genera (1946) 139.
Dryopteris quadriaurita Christ, Philip. Jour. Sci. 2 C (1907) 209.

King 220, Papua; *Schlechter 17759.*

Philippines.

The published description should be amplified to show that the paleae are setulose, the lamina sparsely or deciduosly setulose above, the pinnae pinnate at the very base only, and the sporangia setulose. The King specimen is typical; that of Schlechter is nearly enough so (the pinnae are nowhere pinnate).

34. L. ENSIPINNA (Brause) Copel.

L. ensipinna (Brause) Copel., Genera (1946) 138.
Dryopteris ensipinna Brause, Engler's Jahrb. **56** (1920) 84.

Brass 12929, 13362, alt. 1,200 and 850 m. I have not seen the type, *Ledermann 12773,* nor *Ledermann 12533,* var. *acuminata,* but Brass' collections fit the description. In minutiae, they are like *L. quadriaurita,* but have longer and narrower pinnae and more numerous segments. I suppose that the identification of *Schlechter 17759* is by Brause, and cannot but wonder that he failed to mention the resemblance.

Endemic.

35. DRYOPTERIS QUADRIQUETRA v.A.v.R.

Dryopteris quadriquetra v.A.v.R., Nova Guinea **14** (1924) 16.

Known only by the type collection, *Lam 542,* Mamberamo River, alt. 10 m. Not seen. Stipes glabrescent; fronds dimorphic, subchartaceous.

36. L. IMMERSA (Blume) Moore

L. immersa (Blume) Moore, Index (1857)

Carr 14299, Boridi, alt. 4,000 feet; previously reported.

To Luzon and the Malay Peninsula; reported from Polynesia to India.

37. L. KEYSSERIANA (Ros.) Copel.

L. keysseriana (Ros.) Copel., Genera (1946) 139.
Dryopteris keysseriana Ros., Fedde's Repert. **10** (1912) 333.

Brass 12928, alt. 1,200 m. Described from Sattelberg, alt. 1,600 m, *Bamler 23* (1911); distributed as *Rosenstock Fil. novog. exsicc. n. 121 1. Bamler.* Remarkable for very long-caudate pinnae with oblique bases. *Bamler 82c,* received from Rosenstock under a manuscript name, is a juvenile plant of this species.

Endemic.

38. **L. OBLIQUATA (Mett.) Copel.**

L. obliquata (Mett.) Copel., Genera (1946) 139.
Aspidium obliquatum Mett., Ann. Sc. Nat. IV **15** (1861) 75.

Another species listed by report. *Goadby 27,* from New Britain, is similar but not identical.

New Caledonia.

39. **DRYOPTERIS PEEKELI v.A.v.R.**

Dryopteris Peekeli v.A.v.R., Bull. Dept. Agric. Ind. Néerl. No. 18 (1908) 7.

Known only by the type collection, *Peekel 44,* not seen. Evidently very similar to the preceding species.

40. **L. GRACILESCENS (Blume) Hooker**

L. gracilescens (Blume) Hooker (as to the name), Jour. Bot. **9** (1857) 338.

Brass 12217, alt. 1,750 m. "On ground in a rain-forest ravine; rhizome purple when cut." New to New Guinea.

To India and China.

41. **L. LAUTERBACHII (Brause) Copel.**

L. Lauterbachii (Brause) Copel., Genera (1946) 139.
Dryopteris Lauterbachii Brause, Engler's Jahrb. **49** (1912) 18.

Brass 12127, alt. 1,800 m. The type is *Schultze 273,* Sepik region. Rhizome erect; stipes dark and densely scaly at base; scales sparse upward, caducous on rachis.

Endemic.

42. **DRYOPTERIS STEREOPHYLLA v.A.v.R.**

Dryopteris stereophyla v.A.v.R., Nova Guinea **14** (1924) 17.

Known only by the type, *Lam 1785,* Doorman-top, alt. 3,200 m; not seen.

43. **DRYOPTERIS RIGIDIFOLIA v.A.v.R.**

Dryopteris rigidifolia v.A.v.R., Nova Guinea **14** (1924) 18.

Lam 1481, 1560, 1562, 1890, Doorman Mountains, alt. 1,420–1,450 m; not seen. This and the preceding species were to be expected in the Archbold Expedition collections, but I do not recognize them.

44. **DRYOPTERIS HORIZONTALIS v.A.v.R.**

Athyrium horizontale Ros., Nova Guinea **8** (1912) 722.
Dryopteris horizontalis v.A.v.R., Bull. Buit. II No. XI (1913) 10.

Hellwig-Gebirge, alt. 1,350–1,600 m, *v. Roemer 1136;* not seen. Except that it is described as "subcoriaceo-chartaceous," this would seem very near to *L. gracilescens.*

45. L. CALCARATA (Blume) Moore

L. calcarata (Blume) Moore, Index (1858) 87.

Known from New Guinea by *Ledermann 11740*, det. Brause. Java to India, common and plastic; not known in the Philippines.

46. L. FULGENS (Brause) Copel., comb. nov.

Dryopteris fulgens Brause, Engler's Jahrb. **56** (1920) 89.

Known only by the type collection, *Ledermann 11004*, Hunstein Peak, alt. 1,300 m; not seen. A large relative of *L. falcatipinnula*.

47. L. SUBDIMORPHA Copel. **Plate 20.**

L. subdimorpha Copel., Genera (1946) 140.
Dryopteris subdimorpha Copel., Univ. Calif. Publ. Bot. **18** (1942) 220.

L. rhizomate horizontale 1 cm crasso, basibusque stipitum confertorum paleis fuscis integris plerisque 2–3 mm longis lanceolatis nonnulis 5 mm longis linearibus vestitis; stipite frondis sterilis ca. 25 cm alto, frondis fertilis altiore, brunneo, paleis parvis linearibus sparso, sursum rhachique pubescentibus parce paleolatis; lamina sterile 30 cm vel ultra longa, 20–25 cm lata, subcoriacea, faciebus glabris, apice acuminata pinnatifida, basi truncata; pinnis infimis subdeflexis 13 cm longis 3.5 cm latis, pedicellis 1 cm longis protensis, apicibus integris breviter acuminatis, basibus rotundatis, segmento infimo acroscopico obsoleto, basiscopico abbreviato, alibi ad alam 5 mm latam costae suboblique pinnatifidis, segmentis 6 mm latis obtusis integris margine leviter cartilagineo-incrassatis; costis utraque facie setulosis etiam inferne paleis paucis minutis obscuris sparsis; costulis nudis, venis ca. 10-paribus, infimis ad vel infra sinus conniventibus, infima basiscopica a costula remota e costa egrediente; lamina fertile minore laxiore; soris medialibus, exindusiatis sporangiis nudis.

Dutch New Guinea: 2 km SW. of Bernhard Camp, Idenburg River, alt. 700 m, *Brass 13666;* "rain-forest undergrowth; few tufts on crests of ridges."

Near enough to be conspecific is *Brass 5155*, from Mafulu, Papua, alt. 1,250 m, in Herb. N. Y. Bot. Garden, identified by Christensen as *D. crassifolia* var. *purpureo-lilacina* C. Chr. Its pinnae are more numerous, smaller and in particular narrower, at most 23 mm wide, and the lowest are somewhat deflexed. The type of *L. subdimorpha* is mature, and I can only say of it that no indusia are present; but *Brass 5155* has an immature fertile frond, and sori without any mature sporangia are exin-

dusiate. I do not adopt Christensen's varietal name, because uncertain of identiy with the Bornean varietal type; also, it is too long a name.

The most immediate affinity seems to be to *L. motleyana* (Hooker) Copel., whether that be a distinct species, or, as Ching, Bull. Fan. Bot. **6** (1936) 286, regards it, a variety of *L. crassifolia*. The pinnae of *L. subdimorpha* are more deeply cut. There is some uncertainty as to the indusia of *L. crassifolia* and *L. motleyana*. My specimens of *L. crassifolia* suggest no dimorphism.

48. L. FALCATIPINNULA Copel.

L. falcatipinnula Copel., Genera (1946) 138.
Dryopteris falcatipinnula Copel., Philip. Jour. Sci. **6** C (1911) 74.

King 114, Papua, in lowlands (1908). We have a larger and more perfect specimen than the type,—*Rosenstock Fil. novog. exsicc. n. 199*, supposed to be a part of the original collection, but dated 1911.

49. L ECHINATA (Mett.) Copel.

L. echinata (Mett.) Copel., Genera (1946) 138.
Aspidium echinatum Mett., Ann. Lugd. Bat. **1** (1864) 230.
Dryopteris echinata C. Chr. See Gardens' Bull. **4** (1929) 386.

Listed by Brause, Engler's Jahrb. **56** (1920) 81. I have a New Guinea specimen collected by Zahn, Sattelberg, alt. 900 m, received with this name, but misidentified.

50. L. BELENSIS Copel. **Plate 21.**

L. belensis Copel., Genera (1946) 138.
Dryopteris belensis Copel., Univ. Calif. Publ. Bot. **18** (1942) 220.

L. gregis L. crassifoliae, rhizomate erecto crasso, inter bases stipitum radicumque paleis fuscis ovatis 1.5 mm longis dense setuliferis vestito; stipitibus caespitosis, 40 cm altis, fuscis, basi paleis parvis sat dense vestitis et hic solummodo tuberculatis, sursum rhachibusque paleis lanceolatis et linearibus ciliatis 1–2.5 mm longis sparsis et minute setuliferis, rhachibus infra bases pinnarum glanduliferis; lamina 45 cm longa, 25 cm lata, acuminata, bipinnatifida, fusca, tenuiter coriaceae; pinnis typi 13-paribus, sessilibus, infimis vix abbreviatis haud deflexis, sequentibus 15 cm longis, 3 cm latis, caudato-acuminatis, basi rotundatis, ad alam 2 mm latam costae pinnatifidis, costis superne sulcatis utraque facie setulis brunneis haud densis obsitis; segmentis erecto-patentibus plus minus falcatis, infimis plerumque modo reductis, sequentibus 2 cm longis, basi 5 mm latis, acutis, integris, decidue ciliolatis, superne glabris inferne

ad costulas sparse et decidue setuliferis; venis usque ad 18-paribus, simplicibus, infimis ad vel infra sinus conniventibus vix anastomosantibus, venula infima basiscopica a costula remota e costa oriente; soris costularibus, indusiis parvis setulosis, deciduis.

Dutch New Guinea: Bele River, alt. 2,200 m, *Brass 11509,* "on a limestone cliff in forest; not common;" also, *No. 11327,* same place, an older, somewhat larger specimen, the indusia gone, the sori plainly marked by minute depressions on the upper surface.

This species might be responsible for the report of *L. echinata* in New Guinea, being like that species in connivent veins and slightly scaly rachis. It is more like *L. Hallieri,* but has less setulose costae and costules. Its acute segments are peculiar in the group.

51. L. COSTULISORA Copel.

L. costulisora Copel., Genera (1946) 138.
Dryopteris basisora Copel., Philip. Jour. Sci. 6 C (1911) 73, *non* Christ (1909).

Brass 12465, alt. 2,150 m. The type is *King 304,* from Papua, distributed as *Rosenstock Fil. novog. exsicc. n. 198,* but misdated 1911. *Keysser 23p,* Sattelberg Hinterland, received indet. from Dr. Rosenstock, is also this species. This is a member of the group of *L. crassifolia,* its lowest veins connivent at the sinus, with a raised (on the lower surface) line running from the sinus between them. Rhizome stout, short-creeping, beset with firm, brown densely setuliferous paleae 5 mm long; indusia dark, naked, firm and persistent. *L. wariensis,* to which Christensen, Suppl. I 30. thought this might be reduced, is not a near relative; it is exindusiate, and the lowest veinlets run to the margin above the sinus.

Endemic.

52. L. CHLAMYDOPHORA (Ros.) Copel.

L. chlamydophora (Ros.) Copel., Genera (1946) 138.
Dryopteris chlamydophora Ros. C. Chr., Gardens' Bull. 4 (1929) 384.

Brass 3808, Papua, alt. 500 m; see Brittonia 2 (1937) 297.

Celebes to Burma.

53. L. OPHIURA Copel. **Plate 22.**

L. ophiura Copel., Genera (1946) 139.
Dryopteris ophiura Copel., Univ. Calif. Publ. Bot. 18 (1942) 220.

L. rhizomate erecto, valido, paleis fuscis minute setuliferis 4 mm longis dense vestito; stipitibus approximatis, 15 cm altis,

1 mm crassis, basi imo paleatis, alibi rhachibusque minute pallide pubescentibus stramineis; lamina 20 cm longa, ca. 10 cm lata, acuminata, basi truncata, coriacea, costis superne minute antrorso-strigosis exceptis glabra, bipinnatifida; pinnis ca. 7-paribus, infimis vix reductis haud deflexis, superioribus 1–2-paribus sat abrupte diminutis et integrescentibus, medialibus ca. 6 cm longis, 14 mm latis, in caudas 2 cm longas rectas falcatas vel sinuosis protractis, subsessilibus; segmentis infimis reductis rarius liberis, infimo basiscopico interdum tantum vestigiale; segmentis medialibus ca. 8 mm longis, 2–3 mm latis, subfalcatis, integris margine subdeflexis, obtusis vel oblique acutis; venulis usque ad 10-paribus, immersis, infimis supra sinus terminantibus; soris inframedialibus, indusiis coriaceis persistentibus glabris.

Dutch New Guinea: 18 km SW. of Bernhard Camp, Idenburg River, alt. 2,150 m, *Brass 12471,* small clumps on open rock-slide. There is an evident, but not salient, gland on the rachis under the insertion of each pinna.

54. L. CRASSA Copel. **Plate 23.**

L. crassa Copel., Genera (1946) 138.
Dryopteris crassa Copel., Univ. Calif. Publ. Bot. **18** (1942) 220.

L. rhizomate repente 1 cm crasso, paleis fuscis 1–2 mm longis lanceolatis minutissime setulosis vestito; stipitibus approximatis, 60 cm altis, 3 mm crassis, brunneis, basi imo paleatis alibi glabris; lamina 20–30 cm longa, 15–20 cm lata, acuminata, basi truncata, rhachi et deorsum costis minute purpureo-strigosis, alibi glabra, rigide coriacea, bipinnatifida; pinnis infimis vix diminutis haud deflexis, segmentis infimis reductis; pinnis medialibus frondis maximae 11 cm longis, basi truncatis 2 cm latis, caudato-acuminatis; segmentis 1 cm longis, 3–3.5 mm latis, plerisque subfalcatis, obtusis, margine deflexis, integris; venulis ca. 12-paribus, conspicuis, infimis paullo supra sinus terminantibus; soris subcostularibus, indusiis obscuris nudis fugacibus. Specie praecedente (L. ophiura) differt: rhachi costisque inferne glabris, indusia deciduis.

Dutch New Guinea: 9 km N. E. of Lake Habbema, alt. 2,650 m, *Brass 10878,* type; *ibidem No. 10934.*

Because it grew on a rock-slide, I do not trust the erect rhizome of *L. ophiura* as a fixed character. It and *L. crassa* rook much alike. The darker stipe and rachis, less caudate tips of the pinnae, and slightly greater stature of *L. crassa* may not be essential differences, but the naked axes and transient indusia

should be diagnostic. I am loath to describe these two coriaceous species while two others, *D. stereophylla* and *D. rigidifolia*, from the same region, are unknown to me, but am unable to reconcile the differences in description.

55. L. WANTOTENSIS Copel. **Plate 24.**

L. wantotensis Copel., Genera (1946) 140.
Dryopteris wantotensis Copel., Univ. Calif. Publ. Bot. **18** (1942) 220.

Clemens 11013 bis, Morobe; known by the one collection.

56. L. NEPHROLEPIOIDES (C. Chr.) Copel.

L. nephrolepioides (C. Chr.) Copel., Genera (1946) 139.
Dryopteris nephrolepioides C. Chr., Brittonia 2 (1937) 295, *Fig. 1* (p. 268) *c, d.*

Known only by the type collection, *Brass 5354*, Mafulu, Papua, alt. 1,700 m.

57. L. HUNSTEINIANA (Brause) Copel.

L. hunsteiniana (Brause) Copel., Genera (1946) 139.
Dryopteris hunsteiniana Brause, Engler's Jahrb. **56** (1920) 79.

Brass 12372, alt. 1,500 m, "on shaded bank of stream; fronds glaucous beneath." The type is from Hunstein Peak, alt. 1,350 m, not seen but unmistakable from the description. Brass' plant has the lowest pinnae enlarged and incised, the second pair like the segments above, only free, and remote by about 5 mm.

Endemic.

58. L. SETOSA Presl

L. setosa Presl, Epim. (1849) 40.
Cheilanthes setigera Blume, Enum. (1828) 138.
Lastrea setigera Bedd., Ferns Brit. India, Corr. II (1870), *non* Moore.
Dryopteris setigera O. K., Rev. Gen. Pl. II (1891) 813.

Common at minor altitudes. Polynesia to India.

59. L. ARMATA Copel. **Plate 25.**

L. armata Copel., Genera (1946) 138.
Dryopteris spinosa Copel., Univ. Calif. Publ. Bot. **18** (1942) 219. *non Lastrea spinosa* Newman.

L. leucolepidi similis, paleis basalibus castanesis ovatis glabris axibus minoribus minute puberulis distincta; stipite 75 cm alto basi 1 cm sursum (sicco) 4 mm crasso, stramineo, deorsum paleis castaneis 1–2 cm longis 4–5 mm latis acutis vel acuminatis glabris haud ciliatis vestito, sursum rhachique sparse minutissime puberulis ubique spinis 0.5–1.0 mm longis horridis; lamina

80 cm alta, ovata, acuminata, tripinnata, firme papyracea, fuscescente, superne (etiam in sulcis axium) glabra, rhachibus inferne spinulis sursum minutis armatis, minute obscure debiliter pubescentibus; pinnis infimis 15 cm, medialibus 25 cm longis, 6 cm latis, acuminatis, breviter pedicellatis; pinnulis subsessilibus, recte patentibus, acuminatis, basi 1 cm latis pinnatis, alibi fere ad costam pinnatifidis, segmentis et pinnulis secundariis usque ad 12-paribus infra apicem inciso-serratum, majoribus crenato-dentatis; soris laminam omnino tegentibus, indusiis nullis.

Dutch New Guinea: 9 km N. E. of Lake Habbema, alt. 2,800 m, *Brass 10751.* "Gregarious in young second growth on a native clearing." This is not the place to expect a new species; it is a typical place for *L. setosa* and *L. leucolepis,* both of which enter abandoned clearings in the Philippines like weeds. This species is like them in dissection, and thus in general aspect, but most distinct in its nakedness.

60. L. LEUCOLEPIS Presl

L. leucolepis Presl, Epim. (1849) 39.

Brass 12462, alt. 2,150 m; *Carr 12339,* Ronna, alt. 1,400 feet; probably common. In naming Carr's specimen, Alston has agreed with others who call this *Dryopteris uliginosa* (Kunze) C. Chr.; for some synonyms under that name, see Christensen, Suppl. III 100. Maxon, Proc. Biol. Soc. Washington **36** (1923) 170, has interpreted *Aspidium uliginosum* as *D. setigera, L. setosa* of this enumeration. Backer and Posthumus, Varenflora voor Java, p. 42, treat *D. leucolepis* as a synonym of *D. uliginosa,* Christensen, Suppl III 90, Dansk Bot. Arkiv **9** No. 3 (1937) 44, treats *D. leucolepis* as distinct, and cites New Guinea synonyms, *Cheilanthes gigantea* Ces., *Polypodium cheilanthoides* Baker, and *Dryopteris brunneo-villosa* C. Chr. The original description of *A. uliginosum* Kunze does not show whether it is *L. setosa* or *L. leucolepis;* it is almost certainly one or the other, and its name has priority. Unable to settle the question, I follow Maxon; but compare still Christensen, Engler's Jahrb. **66** (1933) 46.

Polynesia to India and Japan.

24. CURRANIA Copeland

C. OYAMENSIS (Baker) Copel.

C. oyamensis (Baker) Copel., Philip. Jour. Sci. **6** C (1911) 147.
Dryopteris genuflexa Ros., Fedde's Repert. **12** (1913) 175.

Keysser B 56 Bolan, alt. 2,400–3,000 m; isotype of *D. genuflexa* in Herb. Univ. Calif.

Japan; China.

25. CYCLOSORUS Link

Hort. Berol. (1833) 128; Ching, Bull. Fan Bot. 8 (1938) 162; Copeland, Genera (1946) 140.

Cyclosorus is so intimately related to *Lastrea* that its separation is justified only by convenience, both being very large genera. New Guinea may be regarded as the center of evolution of *Cyclosorus*.

Key to the species

Sori round.
- Only one pair of veinlets anastomosing.
  - Fronds under 5 cm broad.
    - Frond practically naked ..... 1. *C. roemerianus*
    - Frond strigose.
      - Fronds uniform ..... 2. *C. Warburgii*
      - Fertile fronds contracted ..... 66. *C. canescens* var.
    - Frond finely pubescent ..... 3. *C. obtusifolius*
  - Fronds 7–10 cm broad.
    - Pinnae subentire ..... 8. *C. mutabilis*
    - Pinnae sharply serrate ..... 9. *C. cataractorum*
    - Pinnae lobed ⅓ to costa ..... 4. *C. adenostegius*
    - Pinnae incised over half-way to costa ..... 5. *Dryopteris repandula*
  - Fronds comparatively large.
    - Margin of pinnae entire to serrate.
      - Indusium naked.
        - Fronds uniform ..... 9. *C. Cataractorum*
        - Fronds dimorphic ..... 6. *C. dimorphus*
      - Indusium setulose ..... 7. *Dryopteris sepikensis*
    - Pinnae pectinate.
      - Basal pinnae not reduced.
        - Veins setose beneath.
          - Pinnae under 15 cm long.
            - Caudex erect ..... 11. *C. albociliatus*
            - Rhizome creeping ..... 12. *C. parasiticus*
          - Pinnae 25 cm long ..... 13. *C. distinctus*
        - Veins naked beneath ..... 14. *C. alatellus*
      - Basal pinnae gradually reduced.
        - Segments 2–2.5 mm wide.
          - Frond about 50 cm tall ..... 15. *Dryopteris perpilifera*
          - Frond over 1 meter tall ..... 16. *Dryopteris hispiduliformis*
        - Segments 4–5 mm wide.
          - Glaucous beneath.
            - Lamina membranaceous ..... 17. *C. austerus*

Lamina chartaceous ..... 18. *C. farinosus*
Not glaucous.
Lamina setulose ..... 19. *Dryopteris hirto-pilosa*
Lamina naked ..... 42. *C. truncatus*
Basal pinnae abruptly reduced.
Lamina setulose above.
Yellowish-gray beneath ..... 18. *C. farinosus*
Greenish beneath.
Saudex erect.
Veins naked above ..... 20. *C. suprastrigosus*
Veins setose above ..... 21. *C. vestigiatus*
Rhizome creeping ..... 22. *C. oblongus*
Lamina naked above.
Lamina over 1 meter long..... 23. *C. superbus*
Lamina smaller ..... 24. *C. heterocarpus*
More than the lowest veinlets anastomosing.
Basal pinnae abruptly reduced.
Margin cut at least one-fourth costa.
Lamina naked above.
Sori strictly costular ..... 25. *C. supraspinigerus*
Sori inframedial or medial.
Nether surface setulose.
Pinnae alternate ..... 26. *C. paraphysatus*
Pinnae opposite ..... 27. *C. paripinnatus*
Nether surface naked.
Pinnae opposite.
Pinnae dilated at base..... 28. *C. deltipterus*
Pinnae not dilated..... 29. *C. subappendiculatus*
Pinnae alternate ..... 30. *C. sogerensis*
Sori extramedial ..... 31. *C. extensus*
Lamnia setulose above.
Veins densely setose beneath..... 32. *C. megaphylloides*
Veins almost naked beneath..... 32. *A. C. sp.*
Margin entire or shallowly toothed.
Pinnae numerous.
Subcoriaceous or thinner.
Pinnae opposite ..... 29. *C. subappendiculatus*
Pinnae alternate.
Setose above ..... 33. *C. Atasripii*
Glabrous or nearly so.
Veins 3 or 4 pairs ..... 34. *Dryopteris tamiensis*
Veins about 6 pairs.
Pinnae truncate at base ..... 35. *C. arfakianus*
Pinnae cuneate ..... 36. *C. gregarius*
Coriaceous ..... 37. *C. unitus*
Pinnae few—3–6 pairs ..... 61. *C. micans*
Basal pinnae gradually reduced.
Upper surface naked or glabrescent.
Pinnae 15 cm long or longer.

Pinnae lobed.
Indusia hairy ..... 40. *Dryopteris piloso-squamata*
Indusia not hairy.
Pinnae cut one-fourth to costa..... 41. *C. megaphyllus*
More deeply cut..... 42. *C. truncatus*
Pinnae crenate to entire..... 35. *C. arfakianus*
Pinnae hardly exceeding 10 cm.
Apparently exindusiate.
Paleae naked ..... 43. *C. rigidus*
Paleae hairy ..... 44. *C. multiauriculatus*
Evidently indusiate.
Pinnae under 15 mm wide.
Pinnae cuneate ..... 53. *C. riparius*
Truncate at base.
Sori about medial.
Rhizome creeping ..... 38. *C. aridus*
Rhizome ≠ erect ..... 45. *C. protectus*
Sori subcostular ..... 39. *C. Archboldii*
(Pinnae 2 cm wide)
Pinnae 2 cm wide.
Pinnae gradually narrowed..... 46. *C. amboinensis*
Pinnae abruptly narrowed..... 47. *C. terrestris*
Upper surface setulose.
Pinnae opposite ..... 29. *C. subappendiculatus*
Pinnae alternate.
Upper surface sparsely hairy.
Pinnae up to 1 cm wide..... 39. *C. Archboldii*
Pinnae 15 mm wide..... 48. *C. confertus*
Upper surface freely hairy.
Pinnae 15 mm wide..... 49. *C. dichrotrichus*
Pinnae up to 11 mm wide.
Auricles on stipe remote.
Pinnae linear-lanceolate ..... 50. *C. hispidulus*
Pinnae broadly lanceolate..... 51. *C. albosetosus*
Auricles crowded ..... 52. *C. strigosissimus*
Basal pinnae not reduced.
Pinnae over 30 cm long..... 54. *C. imponens*
Pinnae much shorter.
Pinnae less than 2 cm wide.
Sori restricted to lobes..... 55. *C. interruptus*
Sori not so restricted.
Lamina setose beneath..... 56. *C. invisus*
Lamina naked.
Costae naked ..... 57. *C. gongylodes*
Costae setulose ..... 10. *C. aquatilis*
Sterile pinnae over 2 cm wide.
Lamina glandulose beneath..... 58. *C. glandulosus*
Lamina not glandulose.
Pinnae abruptly caudate..... 59. *C. cuspidatus*
Pinnae not caudate ..... 60. *C. urophyllus*

Sori elongate, or basal ones confluent.
  Pinnae numerous.
    Base of frond gradually narrowed.
      Base of pinna auriculate ..... 62. *C. hastato-pinnatus*
      Base of pinna cuneate-rounded ..... 63. *C. morobensis*
    Base of frond truncate. (Ampelopteris)
  Pinnae about 5 pairs, all small ..... 67. *C. lanceolus*
  Pinnae 1–3 pairs, fairly large.
    Margin entire or nearly so ..... 64. *C. triphyllus*
    Margin lobed ..... 65. *C. pentaphyllus*
  Frond simple or with few reduced pinnae.
    Body of frond inciso-lobate ..... 66. *C. canescens*
    Body of frond more or less entire ..... 68. *C. beccarianus*

1. C. ROEMERIANUS (Ros.) Copel.

C. roemerianus (Ros.) Copel., Genera (1946) 139.
Dryopteris roemeriana Ros., Nova Guinea 8 (1912) 723.

Brass 11497 (?), Bele River, alt. 2,200 m, "abundant on limestone cliffs in forest." The type, not seen, is *von Roemer 1025,* in mountain forest, alt. 1,350 m, also in Dutch New Guinea. Brass' plant presents inconsistencies with the description, most essentially in having one perfectly regular row of sori on each side of the costa, and in having elongate fronds, about 30 cm long (length not stated by Rosenstock, but shortness indicated by stated shape); but there are so many points of agreement that I am unwilling to describe it as distinct from the unseen species of the same region. The veinlets do not anastomose on the basiscopic side of the pinnae, not anywhere on the smaller pinnae; but on the acroscopic side of the larger ones, the lowest veinlets of seceral veins regularly anastomose, with "radio calloso in sinum excurrente." The probable affinity is not to *Cyclosorus,* but to *Lastrea nephrolepioides* and *L. petrophila.* Endemic.

2. C. WARBURGII (Kuhn and Christ) Wagner and Grether

C. Warburgii (Kuhn and Christ) Wagner and Grether.
Aspidium Warburgii Kuhn and Christ, Monsunia 1 (1900) 81.

Bamler 131 (1914) Sattelberg (type locality of *C. Warburgii*), alt. 400 m, received as *Dryopteris debilis* (Mett.) C. Chr., is more exactly *C. Warburgii,* distinguished by persistent, setose indusia. *Clemens 6522,* Morobe, alt. 1,700 feet, has broader, less densely hirsute pinnae.

Admiralty Ids.; Guam (as *Dryopteris depauperata* Copel.).

3. C. OBTUSIFOLIUS (Ros.) Copel.

C. obtusifolius (Ros.) Copel., Genera (1946) 143.
Dryopteris obtusifolia Ros., Fedde's Repert. **10** (1912) 336.

Known only by the type collection, *Bamler 115,* Sattelberg, alt. 700 m; isotype in Herb. Univ. Calif.

4. C. ADENOSTEGIUS Copel. Plate 6b.

C. adenostegius Copel., Genera (1946) 142.
Dryopteris adenostegia Copel., Univ. Calif. Publ. Bot. **18** (1942) 220.

C. rhizomate brevi-repente 5 mm crasso; stipitibus approximatis, frondis sterilis 10 cm, fertilis 30 cm altis, fuscis, basi paleis paucis fuscis minutis praeditis, alibi cinereo-velutinis vel sursum rhachibusque potius dense setulosis; lamina ca. 30 cm longa, 8–9 cm lata, acuminata, basi angusta; pinnis inferioribus deflexis paucis sensim diminutis, infimis 8 mm longis 5 mm latis oblique deltoideis; pinnis medialibus 4–4.5 cm longis, 12 mm latis, obtusis vel acutis, basi truncatis inconspicue auriculatis, ca. one-third ad costam incisis, segmentis 2–2.5 mm latis, subcoriaceis, costis sparse costulisque sparsius strigosis, venis superne sparsissime setosis, facie superiore laminae sed conspicue setulosa; venis ca. 5-paribus, infimis anastomosantibus, sequentibus 1-paribus ad sinus conniventibus; soris inframedialibus, indusiis glandulis globosis aurantiacis cinctis, sporangiis glabris.

Dutch New Guinea: 9 km N.–E. of Lake Habbema, alt. 2,800 m, terrestrial in forest, *Brass 10282;* type in Gray Herbarium.

This may resemble *Dryopteris repandula* v.A.v.R., the description of which is more elaborate than clear; it (*C. adenostegius*) seems to be distinguished by absence of paleae above the base of the stipe, less deeply incised pinnae, inframedial sori, and gland-bordered indusia.

5. DRYOPTERIS REPANDULA v.A.v.R.

Dryopteris repandula v.A.v.R., Nova Guinea **14** (1924) 20.

Known only by the type, *Lam 1058,* Mamberamo River, alt. 90 m; not seen.

6. C. DIMORPHUS (Brause) Copel., comb. nov.

Dryopteris dimorpha Brause, Engler's Jahrb. **56** (1920) 100.

Known positively only by the type, *Ledermann 12622,* Sepik region, alt. 1,400–1,500 m, not seen. *Carr 15531,* sent to me as this species, has meniscioid venation, which cannot be reconciled with Brause's "Nervis . . . infimis anastomosantibus;" and there are other discrepancies.

From *C. alatellus,* which likewise is commonly dimorphic, *C. dimorpha* seems to be distinguished by very reduced lower pinnae, and by normal pinnae less contracted toward the rachis.

7. DRYOPTERIS SEPIKENSIS Brause

Dryopteris sepikensis Brause, Engler's Jahrb. **56** (1920) 101.

Known by the original collections, *Ledermann 12053* and 11183, Sepik region, alt. 2,070 and 1,300 m, not seen. Judging by description only, this seems suspiciously like the preceding species. Christensen, Suppl. III 97, reduces it to *D. arfakiana* (No. 35), which is hard to reconcile with Brause's description.

8. C. MUTABILIS (Brause) Copel.

C. mutabilis (Brause) Copel., Genera (1946) 143.
Dryopteris mutabilis Brause, Engler's Jahrb. **56** (1920) 97.

Brass 13047, alt. 850 m, on flood-swept river bank. The type is *Ledermann 9745,* Kaiserin-Augusta River, alt. 200–400 m, isotype in Herb. Univ. Calif. The narrowness of the pinnae is responsible for the mostly free veinlets.

9. C. CATARACTORUM Wagner and Grether

C. cataractorum Wagner and Grether, Pterid.

Rook Island, *Bamler R 14,* reported by Rosenstock as "prope D. aquatilem Copel.", which is correct as far as it goes. It is distinguished from *C. aquatilis* by sharply toothed pinnae more narrowly cuneate at the base, and by a single pair of anastomosing veinlets.

Admiralty Ids., along lowland streams.

10. C. AQUATILIS Copel.

C. aquatilis Copel., Genera (1946) 142.
Dryopteris aquatilis Copel., Philip. Jour. Sci. **6** C (1911) 75.

Known only by the type collection, *King 182,* Papua, below the flood level of creeks.

C. Warburgii, C. mutabilis, C. aquatilis and *C. riparia* (No. 53) are all stream-bank plants, similar in adaptation to this habitat, and all probably related.

11. C. ALBOCILIATUS Copel.

C. albociliatus Copel., Genera (1946) 142.
Dryopteris albociliata Copel., Jour. Arnold Arb. **10** (1920) 177.

The type is *Brass 566,* Basiatabu, Papua, alt. 1,500 feet. To this species I now refer *King 405,* from Loane; it is somewhat larger than the type, with broader instead of more numerous segments, and with the same mixture of pale bristles.

Endemic.

12. C. PARASITICUS (L.) Farwell

C. parasiticus (L.) Farwell, Amer. Midland Nat. 12 (1931) 258.

Carr 11645, Veiya, Papua, at sea level, received as *Dryopteris didymosora* (Parish) C. Chr. This identification seems correct, but I can see no detail of difference from the plant I have from Fokien and Tonkin, which is *C. parasiticus* as of late strictly construed. The rhizome is long-creeping. This species, or *C. amboinensis*, may be responsible for the listing of *Dryopteris mollis* (Jacq.) Hieron. as a New Guinea species.

Westward to India.

13. C. DISTINCTUS Copel. Plate 26.

C. distinctus Copel., Genera (1946) 142.
Dryopteris distincta Copel., Univ. Calif. Publ. Bot. 18 (1942) 220.

C. rhizomate ignoto; stipite deorsum fusco, paleis fuscis membranaceis glabris usque ad 12 mm longis basi 1–1.5 mm latis vestito, sursum rhachique brunneis sparsius et decidue paleatis, paleis dejectis spinulis parvis nigris sparsis; lamina grande, herbacea, bipinnatifida, apice breviter acuminata, basi late truncata; pinnis infimis horizontalibus ca. 25 cm longis, 3 cm latis, acuminatis, basi modo angustatis subsessilibus, sequentibus sessilibus basi utroque latere dilatatis, aliter cum basalibus conformibus, ad alam 1.5–2.0 mm latam costae pectinatis, segmentis permultis patentibus subfalcatis obtusis vel subacutis integris usque ad 2 cm longis 2.5–3.0 mm latis; costa superne strigosa, inferne costulisque venisque setulosis, facie inferiore laminae minutissime setulosa; venis ca. 17-paribus, infimis anastomosantibus, sequentibus non conniventibus, soris inframedialibus, indusiis nullis vel vestigialibus, sporangiis setiferis.

New Guinea, present mandated territory: Wareo, alt. 150–180 m, *Bamler W 11* (March, 1914), in Herb. Univ. Calif. *No. 391441*, type; alt. 600 m, *Bamler, Rosenstock Fil. novog. exsicc. n. 243*.

This is *Dryopteris longissima* (Brack.) var. *novoguineensis* Ros., Hedwigia 56 (1915) 351, the type collection of which was published as *Bamler 132;* it was presumably the collection distributed as *Fil. novog. exsicc. n. 243*. As a complete description was needed, and the varietal name could not serve as specific, I chose as the type our more perfect specimen. I have observed before, Bull. B. P. Bishop Museum No. 93 (1932) 38, that *C. longissimus* is endemic in Tahiti, and this New Guinea fern is far too distinct to justify their association. As they are not particularly related, the effect of treating the New Guinea species

as a variety is to present false evidence of floristic affinity between New Guinea and Polynesia.

14. C. ALATELLUS (Christ) Copel.

C. alatellus (Christ) Copel., Genera (1946) 142.
Nephrodium and *Aspidium alatellum* Christ (1901).
Dryopteris stenobasis C. Chr., Index (1905) 294; older synonyms here.
D. logavensis Ros., Fedde's Repert. **10** (1912) 332.
? D. pseudostenobasis Copel., Jour. Arnold Arb. **10** (1929) 176.

First collected in New Guinea by Weinland, but described from the Schuman and Lauterbach collection. In hand are: *Schlechter 18038,* Finisterre Mountains, alt. 800 m; *Bamler 34* and *35,* the latter being *Rosenstock Fil. novog. exsicc. n. 78,-D. logavensis,* the description of which is based on *No. 35; Zahn ss. nn.,* Sattelberg, alt. 900 m, purporting to be determined by Christ as *Nephrodium echinatum* and *N. pteroides,* but without resemblance to either; *Bamler, Rosenstock Fil. novog. exsicc. n. 230,* also from *Logaueng,* and recognized as *D. alatella; Brass 5140,* Mafulu, alt. 1,250 m.

The fertile frond and pinnae of this species may or may not be contracted. Christ noted the dimorphism of the Weinland collection. Rosenstock distinguished his *D. logavensis* by its not being dimorphic,—which is most remarkable, because *Bamler 34,* Rosenstock's *forma minor,* is the contracted form. Both are present on the Zahn collection received as *D. pteroides.* Both are also present on my isotype of *D. stenobasis, Cuming 327;* less distinct on *Ramos, Bu. Sci. 17600,* from Samar; and as somewhat different pinnae on the same frond of *Elmer 13555 A,* from Mindanao. It is a variable species in other respects also,—in the width of its unconstricted segments, and in the indusium, which is more or less fugacious. Because I now recognize this as a variable species, I mistrust the distinctness of *D. pseudostenobasis,* which has no trace of an indusium, and has one or two (perhaps casually) reduced lower pinnae.

Central and Southern Philippines; Celebes.

15. DRYOPTERIS PERPILIFERA v.A.v.R.

Dryopteris perpilifera v.A.v.R., Bull. Jard. Bot. Buitenzorg No. XI (1913) 12.

Known only by the original collection, *Lauterbach 68,* from Finschhafen.

16. DRYOPTERIS HISPIDULIFORMIS C. Chr.

Dryopteris hispiduliformis C. Chr., Suppl. III (1934) 88.
D. hispida Brause, Engler's Jahrb. **56** (1920) 102, *non* O. K.

Authentically known only by the original collections, *Ledermann 11758* and *11709*, Sepik region, alt. 2,070 m. See No. 31 A of this list.

17. C. AUSTERUS (Brause) Copel., comb. nov.

Dryopteris austera Brause, Engler's Jahrb. **56** (1920) 108.

Known only by the type collection, *Ledermann 11750*, Sepik region, alt. 2,070 m. Basal pinnae gradually reduced to rudiments; sori exindusiate.

18. C. FARINOSUS (Brause) Copel., comb. nov.

Dryopteris farinosa Brause, Engler's Jahrb. **56** (1920) 111.

Known only by the type collection, *Ledermann 12103*, Sepik region, alt. 2,070 m. Not too evidently distinct from *C. austerus* from the same locality, which is described as larger and thinner.

19. DRYOPTERIS HIRTO-PILOSA Ros.

Dryopteris hirto-pilosa Ros., Meded. Rijks Herb. No. 31 (1917) 7.

Carr 11113, 11727, Papua, near sea level, det. Alston.

The type is *Merrill 7671*, which I have not, from the Philippines. The Carr specimens conform to what there is of a description.

20. C. SUPRASTRIGOSUS (Ros.) Copel.

C. suprastrigosus (Ros.) Copel., Genera (1946) 143.
Dryopteris suprastrigosa Ros., Fedde's Repert. **10** (1912) 335.

Bamler 37, 4, Sattelberg, distributed as *Rosenstock Fil. novog. exsicc. n. 234*, in Herb. Univ. Calif.; *Brass 5158*, Mafulu, alt. 1,250 m. Described as having medial pinnae 4 cm long; but our specimen, probably *Bamler 4* before distribution, has them up to 9 cm long. It differs from *C. heterocarpus* in having smaller segments and minutely but densely setulose upper surface.

21. C. VESTIGIATUS Copel. **Plate 27.**

C. vestigiatus Copel., Genera (1946) 143.
Dryopteris vestigiata Copel., Univ. Calif. Publ. Bot. **18** (1942) 220.

C. rhizomate erecto vel adscendente, basibusque stipitum fasciculatorum paleis castaneis lanceolatis ca. 4 mm longis sparsis; stipite 50 cm alto, 4 mm crasso, fusco sursum glabro vel glabrescente vestigiis nonnullis omnino inconspicuis pinnarum praedito; lamina 1 m alta vel altiore, 30–35 cm lata, sensim acuminata, basi (absque vestigiis pinnarum) truncata, bipinnatifida, rhachi minutissime pubescente; pinnis ultra 40-paribus, brevi-pedicellatis, infimis aut deflexis aut horizontalibus, rhachin versus angustatis, medialibus basi truncatis, usque ad 18 cm

longis 2 cm latis, caudato-acuminatis, alibi ad alam 2 mm latam costae pinnatifida, herbacea, segmentis 3.5–4 mm latis, obtusis, superne costis ochroleuco-strigosis venis sparse et decidue albosetosis lamina minutissime decidue setulosa, inferne costis glabrescentibus aliter glabris; venis ca. 9-paribus, infimis anastomosantibus, sequentibus ad marginem supra sinus rotundun attingentibus; soris medialibus, indusiis fugacibus vel nullis, sporangiis nudis.

Dutch New Guinea: 15 km S.W. of Bernhard Camp, Idenburg River, alt. 1,600 m, *Brass 12317,* "Plentiful in undergrowth of rain-forest gullies; fronds somewhat over 2 m long, spreading from a slender stock up to 60 cm long."

Apparently related to *C. alatellus* and *C. heterocarpus;* nearest to *C. oblongus* of the several similar species described by Brause. There seems to be hardly a limit to the number of similar but distingishable species in this group.

22. C. OBLONGUS (Brause) Copel., comb. nov.

Dryopteris oblonga Brause, Engler's Jahrb. **56** (1920) 109.

Known only by the type collection, *Ledermann 10100,* Sepik region, alt. 1,000 m. Epiphytic; distinguished from *C. austerus* by abrupt contraction of base of frond, and more deeply cut pinnae.

23. C. SUPERBUS (Brause) Copel., comb. nov.

Dryopteris superba Brause, Engler's Jahrb. **56** (1920) 105.

Known only by the original collections, *Ledermann 11733* and *11848,* Sepik region, alt. 2,070 m. Terrestrial; lamina 125 cm long; medial pinnae 17 cm long; lower pinnae rather abruptly reduced to rudiments.

24. C. HETEROCARPUS (Blume) Ching

C. heterocarpus (Blume) Ching, Bull. Fan Bot. **8** (1938) 180.

Reported, as *Dryopteris heterocarpa, Ledermann 11601.* The only New Guinea specimen I have seen under this name was misidentified.

Cyclosorus sp., King 404, from Ambasi, apparently undescribed, is a member of the preceding group, with a few lowest pinnae abruptly reduced to rudiments, costae naked beneath, and indusia fugacious or none.

25. C. SUPRASPINIGERUS (Ros.) Copel.

C. supraspinigerus (Ros.) Copel., Genera (1946) 143.
Dryopteris supraspinigera Ros., Hedwigia **56** (1915) 353.

Bamler 91 (1913), Sattelberg, alt. 900 m; isotype in Herb. Univ. Calif. Not again collected.

26. C. PARAPHYSATUS Copel.

C. paraphysatus Copel., Genera (1946) 143.
Dryopteris paraphysata Copel., Philip. Jour. Sci. 6 C (1911) 74.

King 306, Papua. With this may probably be identified *Brass 13836* and *13837*, Idenburg River, alt. 150 m, in a rocky ravine on lower mountain slopes. These specimens show moderate dimorphism, and it is the fertile frond which is like the single frond of the type. Sterile pinnae reach 23 cm in length and 3.5 cm in width, cut one-third of the way to the costa. The rhizome is stout, creeping, clothed at the apex with fuscous pubescent paleae.

27. C. PARIPINNATUS Copel. **Plate 28.**

C. paripinnatus Copel., Genera (1946) 143.
Dryopteris paripinnata Copel., Univ. Calif. Publ. Bot. 18 (1942) 220.

C. rhizomate erecto, apice basibusque stipitum haud congestorum paleis fuscis membranaceis integris glabris lanceolatis vix 1 cm longis vestitis; stipite usque ad 1 m alto, fusco, glabrescente, sursum rudimentis nonnullis remotis pinnarum praedito; lamina ca. 80 cm alta, basi truncata, pinnis oppositis, sursum in segmenta apicis acuminati sensim transeuntibus, infimis expansis et medialibus ca. 20 cm longis, 2–2.5 cm latis, in apices acuminatos integros subfalcatos protractis, subsessilibus basibus paullo angustatis, subcoriaceis, costas versus ultra medium pinnatifiidis, segmentis rotundatis ca. 5 mm latis; rhachi fulvo-setosa, costis utrinque leviter setosis, costulis superne nudis inferne venisque breviter sparse setosis, lamina superne glabra inferne minute sparse setulosa; venis usque ad 9-paribus, infimis anastomosantibus, sequentibus 1-paribus conniventibus et plerisque anastomosantibus, ceteris secus marginem curvis; soris inframedialibus, indusiis glabris, sporangiis non spinuliferis.

Dutch New Guinea: 15 km S.W. of Bernhard Camp, Idenburg River, alt. 1,700 m, *Brass 12435*, type, "a large clump-fern common in rain-forest gullies;" *No. 12156*, ibidem.

Remarkable for its height and its rather remote, strictly opposite pinnae. It differs from *C. appendiculatus* in much firmer texture, pinnae contracted at base, and in other details. Other *Cyclosorus* species with opposite pinnae are *C. biauritus* in India, *C. malodorus* in the Solomons, *C. pennigerus* in New Zealand, none evidently related to *C. paripinnatus*. Affinity to the group of *C. crassifolius* is likewise not apparent.

Carr 10202 represents a relataed species, with few, relatively broad pinnae less deeply lobed, its veins sparsely setose above.

28. C. DELTIPTERUS Copel. **Plate 29.**

C. deltipterus Copel., Genera (1946) 142.
Dryopteris deltiptera Copel., Univ. Calif. Bot. 18 (1942) 220.

C. paripinnato affiinis, pinnis basi dilatatis et facie inferiore glabra distinctus; rhizomate adscendente, apice basibusque stipitum confertorum paleis fuscis membranaceis nudis integris ca. 1 cm longis vestitis; stipite ca. 60 cm alto, brunneo, sursum in sulca strigoso alibi glabro, rudimentis nonnullis pinnarum praedito; lamina usque ad 1 m longa, apice breviter acuminato inciso deltoideo basi truncato; pinnis oppositis, remotis, inferioribus sterilibus 15 cm longis acutis basi 3.5 cm latis truncatis sessilibus, subcoriaceis, $\frac{1}{2}$—$\frac{1}{3}$ ad costas incisis, segmentis rotundatis integris; rhachi costisque superne strigosis, inferne cum facie tota glabris; venis ca. 14-paribus, quorum ca. 6-paribus anastomos-antibus, liberis in marginem angustum cartilagineum curvis; fronde fertile modo contracta, pinnis profundius incisis, venis ca. 10-paribus fere omnibus soriferis; soris inframedialibus, indusiis persistentibus glabris.

Dutch New Guinea: Bele River, alt. 2,200 m, *Brass 11260,* type in Gray Herbarium, "large ground fern, common in floodplain forest."

A relative of *C. paripinnatus,* most conspicuously distinguished by the form of the pinnae, uniformly narrowed from the broad truncate base to the apex.

29. C. SUBAPPENDICULATUS Copel. **Plate 30.**

C. subappendiculatus Copel., Genera (1946) 143.
Dryopteris subappendiculata Copel., Univ. Calif. Publ. Bot. 18 (1942) 220.

C. rhizomate ignoto; stipite ad vestigia infima pinnarum 10 cm, ad pinnas normales 35 cm alto, basi nigro paleis paucis brunneis 6 mm longis praedito, alibi rhachique fuscis setis obscuris brevibus vestitis; lamina 90 cm longa, 30 cm lata, subdimorpha, basi truncata, segmento apicale 15 cm longo integro-acuminato deorsum inciso-lobato, alibi pinnata; pinnis ca. 16-paribus normalibus, oppositis, remotis, inferioribus 18 cm longis, 2.5–3 cm altis, acuminatis, basi truncatis vix dilatatis, sterilibus inciso-crenatis lobis 5 mm latis 1.5 mm longis truncatis, papyraceis, costis superne appresso-strigosis, inferne glabris, costulis venis et lamina glabris; venis 4–6-paribus plerisque anastomosantibus; pinnis infimis 6-paribus abrupte in auriculas triangulari-hastatas 1 cm longas reductis; pinnis fertilibus lobatis, lobis 5 mm latis 2–3 mm longis falcato-truncatis; soris medialibus vel infra-

medialibus, indusio inconspicuo brunneo setis paucis ornato, sporangiis nudis.

Dutch New Guinea: 15 km S.W. of Bernhard Camp, Idenburg River, alt. 1,700 m, *Brass 12247;* "Several clumps in undergrowth of rain-forest gulley; fronds dimorphous, ± 1 m long."

Near *C. deltipterus*, distinguished by longer, narrower pinnae, with parallel and less incised margins, the rudimentary pinnae below the base of the normally developed frond larger and conspicuous.

29a. C. APPENDICULATUS (Blume) Copel.

C. appendiculatus (Blume) Copel., Genera (1946) 142.

Reported from New Guinea. I have seen no specimen, and suspect wrong identification.

30. C. SOGERENSIS (Gepp) Copel.

C. sogerensis (Gepp) Copel., Genera (1946) 143.
Dryopteris sogerensis Gepp, Jour. Bot. **61** (1923) Suppl. 61.

Described from collections by Forbes at Sogere, Papua, alt. 1,700–2,500 feet; pinnae 15–19 cm long, 1.5–2 cm wide; not well distinguished by description from *C. paraphysatus*. But, identified as this species, comes *Carr 14667*, Boridi, alt. 3,500 feet, pinnae 30 cm long, 3–3.5 cm wide, distinguishable in many ways. Identical with this specimen is *King 411*, from Mamba, Papua.

Endemic.

31. C. EXTENSUS (Blume) Ching

C. extensus (Blume) Ching, Bull. Fan Bot. **8** (1938) 182.
Aspidium extensum Blume, Enum. (1828) 156.

Schlechter 16349, alt. 180 m. Our specimen of this collection might not be identified, but bears this name, and it may well be correct.

Supposed to range from New Caledonia to Africa.

31a. CYCLOSORUS sp.

Brass 5197, in Herb. N. Y. Bot. Garden as *Dryopteris hispiduliformis* (No. 16), has the lower pinnae abruptly reduced, 1 or 2 anastomosing veinlets above the lowest pair, and lamina setulose beneath. It is near *C. tadavensis* of Mindanao, but not identical.

32. C. MEGAPHYLLOIDES (Ros.) Copel.

C. megaphylloides (Ros.) Copel., Genera (1946) 143.
Dryopteris megaphylloides Ros., Fedde's Repert. **12** (1913) 174.

Keysser 120, Sattelberg, alt. 800–1,000 m. Our specimen is labelled as *Bamler 120*, almost surely a mistake. Also (var.

glabrescens Ros.) *Rosenstock Fil. novog. exsicc. n. 233. King 487,* mountains behind Medan, is approximately this species, more setose than the type, and with broader lobes.

32a. CYCLOSORUS sp.

Carr 14202, Boridi, alt. 5,000 feet, received as *D. megaphylloides* and conforming reasonably to the description, is really no near relative; it is probably undescribed.

33. C. ATASRIPII (Ros.) Copel.

C. Atasripii (Ros.) Copel., Genera (1946) 142.
Dryopteris Atasripii Ros., Meded. Rijks Herb. No. 31 (1917) 6; C. Chr., Brittonia 2 (1937) 298.

Brass 13844, Idenburg River, alt. 85 m, frequent on lower forested slopes; *Bamler* **51** (1912) Logaueng, alt. 400 m, det. Rosenstock; *Brass 5153,* det. Christensen, and the subject of the first adequate description of the species. Here belongs also *Schlechter 16855,* alt. 500 m, received as *D. sagittifolia.* It thus occurs at minor and middle altitudes throughout the island. Endemic.

34. DRYOPTERIS TAMIENSIS Brause

Dryopteris tamiensis Brause, Engler's Jahrb. **49** (1912) 23.

Known only by the sterile type, *Schultze* (*33*) *86,* from the interior of Kaiser-Wilhelmsland, alt. 1,600 m.

35. C. ARFAKIANUS (Baker) Copel.

C. arfakianus (Baker) Copel., Genera (1946) 142.
Dryopteris arfakiana (Baker) C. Chr., Index (1905) 253; Dansk Bot. Arkiv **9** No. 3 (1937) 50.

King 483, and (?) 485, from mountains behind Medan; *Carr 12021,* Koitake, Papua, alt. 1,500 feet. So far as my specimen shows, *Carr 15531,* Isuarava, alt. 4,500 feet, is the same species. Here also *Schlechter 17743* and *17746,* Kani Mountains, alt. 1,000 m, and *Bamler, Rosenstock Fil. novog. exsicc. n. 231,* Sattelberg, alt. 900 m, all received as *Dryopteris arbuscula,* but with little resemblance to the fern properly so called. Christensen regards *D. sepikensis* as a small form of this species. *King 483* has an erect caudex 20 cm tall; the paleae are puberulent. Endemic.

36. C. GREGARIUS Copel. **Plate 31.**

C. gregarius Copel., Jour. Arnold Arb. **24** (1943) 440.

Known only by the type collection, *Brass 6759,* from the upper Fly River, alt. 80 m.

36A. C. CYATHEOIDES (Kaulfuss) Farwell

C. cyatheoides (Kaulfuss) Farwell, Amer. Midland Nat. 12 (1931) 258.

Reported from New Guinea, but probably in error; so far as I know it, this species is endemic in Hawaii.

37. C. UNITUS (L.) Ching

C. unitus (L.) Ching, Bull. Fan Bot. 8 (1938) 196.

Brass 11587, 13250, probably 2,200 and 850 m; the former altitude is notable for this species, but the location was grassland, formerly cultivated.

Common, to Polynesia and East African islands.

38. C. ARIDUS (Don) Ching

C. aridus (Don) Ching, Bull. Fan Bot. 8 (1938) 194.

Papua, *King 172, 403; Brass 1407;* Kaiser-Wilhelmsland, *Schlechter 16777.*

To India and Fiji.

39. C. ARCHBOLDII (C. Chr.) Copel.

C. Archboldii (C. Chr.) Copel., Genera (1946) 142.
Dryopteris Archboldii C. Chr., Brittonia 2 (1937) 297.

Papua: Mt. Tafa, alt. 2,400 m, *Brass 4875.* Collected only once.

40. DRYOPTERIS PILOSO-SQUAMATA v.A.v.R.

Dryopteris piloso-squamata v.A.v.R., Bull. Agric. Ind. Ind. Néerl. III (1908) 4.

Described from a cultivated plant in the Buitenzorg Garden, originally from Skroe, New Guinea.

41. C. MEGAPHYLLUS (Mett.) Ching

C. megaphyllus (Mett.) Ching, Bull. Fan Bot. 8 (1938) 225.

Unknown to me in New Guinea. Cited are *Ledermann 7553, 8316,* and, as var. *abbreviata* Ros., *Keysser 262.*

To the Philippines and Africa.

42. C. TRUNCATUS (Poiret) Farwell

C. truncatus (Poiret) Farwell, Am. Midland Nat. 12 (1931) 259.

Brass 12221, 12273, alt. 1,750 m; *Bamler, Rosenstock Fil. novog. exsicc. n. 235; Brass 5144,* Papua, alt. 1,250 m.

To India.

43. C. RIGIDUS (Ridley) Copel., comb. nov.

Goniopteris rigida Ridley, Trans. Linn. Soc. Bot. II 9 (1916) 258.
Cyclosorus Wollastonii (v.A.v.R.) Copel., Genera (1946) 143.

The original description of this species was very inadequate; However, it has a type, of which Mr. Alston has been good

enough to send me a photograph. *Brass 10287, 10826,* Lake Habbema, alt. 2,800 m, resemble it just enough so that I do not care to give them a new name. Because the identification is doubtful, I will not correct and amplify the description, more than is done in the key to the species.

44. C. MULTIAURICULATUS Copel. **Plate 32.**

C. multiauriculatus Copel., Genera (1946) 143.
Dryopteris multiauriculata Copel., Uinv. Calif. Bull. Bot. 18 (1942) 221.

C. caudice stricte erecto, stipitibus et radicibus exclusis 1 cm diametro, apice stipitibusque paleis rufo-ferrugineis ca. 7 mm longis lanceolatis pubescentibus vestitis; stipitibus 5–10 cm longis, caudici appressis; frondibus subdimorphis, acuminatis, deorsum longe gradatim usque ad apicem caudicis angustatis; fronde sterile 80–100 cm alta, 20 cm lata, rhachi fusco-setosa; pinnis permultis, alternantibus, sessilibus, basi truncatis, acutis, medialibus 10 cm longis, basi leviter dilatatis 1.5 cm latis, integris vel obscure crenulatis, firme papyraceis, costis superne sparse inferne densius setulosis, alibe setulosis setulis caducis; venis 4– 5-paribus, plerisque anastomosantibus; pinnis superioribus in segmenta apicis sensim transeuntibus; fronde fertile paullo minore, venis 3– 4-paribus omnibus soriferis, soris medialibus, primo orbicularibus deinde nonnulis elongatis, infimis saepe more Meniscii confluentibus, tum demum faciem inferiorem omnino tegentibus, indusiis invisis, sporangiis nudis.

Dutch New Guinea: 6 km SW. of Bernhard Camp, Idenburg River, alt. 1,150 m, *Brass 12850,* type, "common ground fern in rain-forest gullies; fronds dimorphous, spreading from an erect stock up to 40 cm in length;" also, *No. 13054,* alt. 850 m.

Similar, and probably related, to *C. hastato-pinnatus, No. 62,* which has a symmetrical entire terminal leaflet, and erecto-patent lateral pinnae pronged on the upper side, with the surface probably naked from the start; they are alike in the gradual shortening of the crowded lower pinnae, the lowest broadly triangular.

45. C. PROTECTUS Copel. **Plate 33.**

C. protectus Copel., Genera (1946) 143.
Dryopteris protecta Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

C. caudice erecto, 10–12 mm diametro, apice dense et stipitibus sparsius paleis fuscis 7–10 mm longis late lanceolatis minutissime decidue puberulentibus vestitis; stipitibus ad vestigia infima pinnarum 5–10 cm altis; lamina 70–80 (basi contracta exclusa ca. 50 cm) alta, 14 cm lata, apice pinnatifida acuminata, basi

sensim vel subabrupte contracta, pinnis infimis remotis ad vestigia vix manifesta reductis, rhachi ferrugineo-setulosa; pinnis medialibus alternantibus, subsessilibus, 7.5 cm longis, 13 mm latis, acutis, basi truncatis, one-fourth to one-third ad costam incisis, segmentis 2.5 mm latis, subcoriaceis, costis breviter strigosis, costulis venisque sparse setulosis, lamina glabra; venulis ca. 5-paribus, biparibus plerumque anastomosantibus; soris inframedialibus (haud costularibus), indusiis persistentibus setulosis.

Dutch New Guinea: 9 km N.–E. of Lake Habbema, alt. 2,800 m, *Brass 10933,* type; "Abundant in thin secondary forest on an old landslip; leaves spreading from a semi-erect slender stem 40–50 cm high;" *No. 11246,* Bele River, alt. 2,300 m; *No. 12470,* on an open rock-slide, alt. 2,150 m, fronds only 45 cm long and hardly 10 cm wide.

46. C. AMBOINENSIS (Willd.) Copel.

C. amboinensis (Willd.) Copel., Genera (1946) 142.
C. subpubescens (Blume) Ching, Bull. Fan Bot. 8 (1938) 211.

Both of these species, as well as *Dryopteris mollis* which has been used as a name of both, have been reported from New Guinea. *Carr 11635,* from Veiya, Papua, comes as *C. subpubescens.*

C. dentatus (Forsk) Ching, which, broadly construed, can include all of these, is then pantropic.

47. C. TERRESTRIS Copel. **Plate 34.**

C. terrestris Copel., Genera (1946) 143.
Dryopteris terrestris Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

C. rhizomate brevi-repente, basibusque stipitum paleis atrofuscis ca. 4 mm longis microscopice setuliferis vestitis; stipitibus approximatis, usque ad vestigia infima pinnarum 10–15 cm, usque ad pinnas normales 30 cm altis, rhachibusque minute appresso-setosis; lamina (basi contracta exclusa) ca. 45 cm longa, 15 cm lata, apice 15 cm longo pinnatifido acuminato; pinnis infimis paucis remotis ad vestigia reductis, infimis normalibus deflexis, 5–6 cm longis, media longitudine quam basi latioribus; medialibus 7–8 cm longis 2 cm latis, alternantibus, sessilibus, basi recte truncatis, abrupte falcato-acuminatis et hic integris, alibi serratis vel inciso-serratis, papyraceis, microscopice sparse setulosis oculo nudo glabris; venulis 5-paribus, plerisque anastomosantibus et soriferis; soris medialibus, indusiis et sporangiis setuliferis.

Dutch New Guinea: 2 km S.–W. of Bernhard Camp, Idenburg River, alt. 700 m, *Brass 13660;* "Rain forest; common ground

fern on steep slopes;" The illustration, *Plate 35,* shows the peculiar form of the pinnae, better than is possible with words.

48. C. CONFERTUS (Brause) Copel.

C. confertus (Brause) Copel., Genera (1946) 142.
Dryopteris conferta Brause, Engler's Jahrb. **49** (1912) 22, *f, 1 F.*

Kani-Gebirge, alt. 700 m, *Schlechter 17846,* isotype in Herb. Univ. Calif. *Brass 3849,* Dieni, Central Division, Papua, alt. 500 m, is superficially similar, but is long-stipitate, and has minute indusia and naked sporangia. Brause's figure of the whole frond gives little idea of its appearance.

Endemic.

49. C. DICHROTRICHUS Copel.

C. dichrotrichus Copel., Genera (1946) 142.
Dryopteris dichrotricha Copel., Philip. Jour. Sci. **6** C (1911) 74.

Papua, *King 294, 219;* otherwise unknown. This species and *D. dichrotrichoides* v.A.v.R., a Philippine species, are reversed by Christensen, Suppl. III 84.

50. C. HISPIDULUS (Dec.) Copel.

C. hispidulus (Dec.) Copel., Genera (1946) 142.
Aspidium hispidulum Decaisne, Nouv. Ann. Mus. Paris **3** (1834) 346.
Dryopteris angusta Copel., Philip. Jour. Sci. **9** C (1914) 3.

King 408, type of *D. angusta,* from Papua *Schlechter 16805,* alt. 300 m; *Bamler, Rosenstock Fil. novog. exsicc. n. 232,* alt. 800 m. *Dryopteris perpilifera* v.A.v.R., No. 15 of this list may be another synonym.

Malaya; Samoa.

51. C. ALBOSETOSUS Copel. **Plate 35.**

C. albosetosus Copel., Genera (1946) 142.
Dryopteris albosetosa Copel., Univ. Calif. Publ. Bot. **18** (1942) 221.

C. rhizomate brevi-repente, 3 mm crasso, basibusque stipitum paleis atrocastaneis ovatis minute ciliatis vestitis; stipitibus approximatis, usque ad vestigia infima pinnarum ca. 5 cm (ad laminam expansam 10–15 cm) altis, sursum rhachibusque breviter cinereo-setosis et pulverulentibus; lamina (pinnis infimis ca. 6-paribus subabrupte reductis exclusis) 20–25 cm longa, 7 cm lata, sursum in apicem acuminatum pinnatifidum 7–9 cm longum sensim angustata; pinnis infimis normalibus paullo abbreviatis vix deflexis, medialibus alternantibus subsessilibus, 4 cm longis, 1 cm latis, obtusis vel subacutis, basi truncatis, inciso-dentatis dentibus 3 mm latis margine deflexis, subcoriaceis, superne ubique albosetosis; venulis 5– 6-paribus quarum 3-paribus anastomosantibus; soris medialibus, indusiis et sporangiis setosis.

Dutch New Guinea: Bele River, alt. 2,200 m, *Brass 11435;* "Abundant in small clumps on dry face of a limestone wall in forest shade."

Related to *C. confertus,* but pinnae smaller, more incised and more setose.

52. C. STRIGOSISSIMUS Copel. **Plate 36.**

C. strigosissimus Copel., Genera (1946) 143.
Dryopteris strigosissima Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

C. rhizomate erecto, breve, stipitibusque paleis atrofuscis ovatis acuminatis minute pubescentibus usque ad 8 mm longis vestitis; stipitibus fasciculatis, 2–4 cm longis; lamina 40 cm longa, 10 cm lata, apice acuminato 2 cm et pinnatifido 4 cm longo, basi angustata et deinde in crus 10 cm longum contracta, pinnis hic contiguis vel imbricatis sursum 1 cm longis triangulari-hastatis deorsum sensim ad vestigia diminutis, rhachi dense fulvo-tomentosa; pinnis medialibus alternantibus sessilibus, acuminatis, basi paullo dilatatis 8–10 mm latis fere contiguis, dentatis dentibus 1 mm longis 2 mm latis, papyraceis, facie superiore ubique densissime breviter pallide setosa; venulis ca. 5-paribus, 3-paribus anastomosantibus; soris medialibus, indusiis magnis persistentibus dense setosis, sporangiis glabris.

Dutch New Guinea: Bele River, alt. 2,200 m., *Brass 11436.* "A few tufted plants on dry face of a limestone cliff in forest shade."

It will be observed that this and the preceding species were collected together and look much alike. Two superficially similar Mexican species grow on shaded limestone cliffs.

53. C. RIPARIUS Copel. **Plate 37.**

C. riparius Copel., Genera (1946) 143.
Dryopteris riparia Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

C. rhizomate adscendente, 4 mm crasso, basibusque stipitum paleis paucis fuscis ovatis subglabris 2 mm longis vestitis; stipitibus confertis, usque ad pinnas infimas remotas vestigiales 5–12 cm altis, pube decidua et paleolis paucis caducis praeditis; lamina 40 cm longa, 7–9 cm lata, apice acuminato pinnatifido breve, basi sensim vel abrupte contracta pinnis reductis paucis, rhachi superne strigosa, inferne setulosa vetustate glabrescente; pinnis medialibus alternantibus subsessilibus, 5.5 cm longis, vix 1 cm latis acutis basi cuneatis interdum subauriculatis, ⅓ ad costam inciso-serratis dentibus 3 mm latis 1.5 mm longis, subcoriaceis, costis superne strigosis, aliter glabris; venulis biparibus anastomosantibus, 2 3-paribus liberis; soris medialibus, indusiis persistentibus sporangiisque glabris.

Dutch New Guinea: 4 km S.W. of Bernhard Camp, Idenburg River, alt. 800 m, *Brass 13048*. "Very abundant on steep, shaded, flood-swept bank of river."

There is some resemblance to the Philippine *C. philippinensis*, but this may be due wholly to the common habitat. Typically flood-swept species look alike, the world over.

54. C. IMPONENS (Ces.) Copel.

C. imponens (Ces.) Copel., Genera (1946) 142.
Dryopteris imponens (Cesati) C. Chr.; see Dansk Bot. Arkiv **9** No. 3 (1937) 50.
D. armata Ros. Hedwigia **56** (1915) 351.
D. muricata Brause, Engler's Jahrb. **56** (1920) 106.

Brass 12948, 13269, 13728, alt. 800–1,200 m; *Carr 15410*, Isuarava, alt. 4,500 feet; *Bamler 111*, Sattelberg, alt. 700–800 m, distributed as *Rosenstock Fil. novog. exsicc. n. 242*, both in Herb. Univ. Calif. *King 455* is near this species, not identical.

D. muricata is reduced by description. Brause distinguished it from *D. armata:*

1. By the basal paleae. In this respect, *Brass 12948*, his only specimen with stipe base, fits Brause's description. Our stipe base of *Bamler 111* is that of a small frond, certainly of the same species.

2. By the spacing of the pinnae, described by Brause as "subcontiguis." They are contiguous on the upper part of the frond of *Bamler 111*, but are rather remote toward the base of specimens showing the base; *Brass 12948* shows both base and apex. Brause's specimen was evidently incomplete,—"Folia usque ad 2 m (e scida) longa." Brass' note on No. *13269* shows a total height of 4 meters.

3. By elongate sori, especially the lower ones. This is more or less evident on all specimens.

Endemic.

55. C. INTERRUPTUS (Willd.) Ching

C. interruptus (Willd.) Ching, Bull. Fan Bot. **8** (1938) 184.
Aspidium pteroides Sw., *non Polypodium pteroides* Retz.

Carr 11123, 11722, Papua, at sea level.

To India and China; and reported from Queensland and Polynesia.

56. C. INVISUS (Forster) Copel.

C. invisus (Forster) Copel., Genera (1946) 142.
Polypodium invisum Forster, Prod. (1786) 81.

Brass 5538, Mafulu, Papua, alt. 1,250 m; previously reported. Polynesia, Philippines.

57. C. GONGYLODES (Schkuhr) Link

C. gongylodes (Schkuhr) Link, Hort. Berol. II (1833) 128.

Brass 14076, alt. 50 m. "Massed in floating grass of deep, open marshes; common." It should be common in wet meadows, but seems not to have been reported before in New Guinea.

All warm lands; New Zealand.

58. C. GLANDULOSUS (Blume) Ching

C. glandulosus (Blume) Ching, Bull. Fan Bot. 8 (1938) 227.

Reported from New Guinea but I have seen no specimen.

Malaya; Philippines; Solomon Islands.

59. C. CUSPIDATUS (Blume) Copel.

C. cuspidatus (Blume) Copel., Genera (1946) 142.
Meniscium cuspidatum Blume, Enum. (1828) 114.

I have seen no specimen; Brause cites *Ledermann 9743* as *Dryopteris urophylla,* var. *cuspidata.*

Malaya; Philippines.

60. C. UROPHYLLUS (Wall.) Copel.

C. urophyllus (Wall.) Copel., Genera (1946) 143.

King 258, Papua; *Bamler, Rosenstock Fil. novog. exsicc. n. 174,* Sattelberg, alt. 900 m. There is also var. *peraspera* v.A.v.R., *Lam 677,* not seen.

Asia to Australia and Fiji.

60a. DRYOPTERIS RUFO-PILOSA Brause

Dryopteris rufo-pilosa Brause, Engler's Jahrb. **56** (1920) 106.
Goniopteris rudis Ridley. Trans. Linn. Soc. Bot. II **9** (1916) 259.

A photograph of the type, kindly sent by Mr. Alston, shows the pinnae to be alternate, the veinlets up to 11 pairs, the soti medial,—all contrary to the description. I do not see why it is not *C. urophyllus.*

61. C. MICANS (Brause) Copel.

C. micans (Brause) Copel., Genera (1946) 143.
Dryopteris micans Brause, Engler's Jahrb. **56** (1920) 98.

Brass 12900, 13392, alt. 850 and 1,150 m. Described from *Ledermann 12468* and *11278.* Endemic.

62. C. HASTATO-PINNATUS (Brause) Copel.

C. hastato-pinnatus (Brause) Copel., Genera (1946) 142.
Dryopteris hastato-pinnata Brause, Engler's Jahrb. **56** (1920) 112.

Brass 13419, alt. 850 m, "scattered in the stony bed of a rain-forest stream." Described from *Ledermann 8237, 7047.*

Suggestive of *C. aquatilis* and *C. riparia,* in adaptation to the common habitat.

Endemic.

63. C. MOROBENSIS Copel. **Plate 38.**

C. morobensis Copel., Genera (1946) 143.
Dryopteris morobensis Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

Pseudomeniscium trunco arboreo 150 cm alto (teste lectore); stipite 20 cm alto 6 mm crasso, fusco, basi paleis fuscis appressis integris membranaceis 1 cm longis vestito, alibi glabrescente asperulo; lamina ultrametrale subdimorpha, pinnata, basi sensim longe angustata, rhachi glabra ad basin pinnae quaeque aerophoro praedita; frondis sterilis pinna apicale obscure crenata aliter ceteris conforme, pinnis inferioribus gradatim reductis et remotis, infimis vix 5 mm longis et latis; pinnis medialibus permultis alternantibus, erecto-patentibus, 20–25 cm longis, 1.5–2 cm latis, sensim acuminatis, subsessilibus, basi acroscopica cuneata basiscopica rotundata, integris vel sinuatis, subcoriaceis, glabris; venulis 3- 4-paribus oblique anastomosantibus, 1-2-paribus brevibus liberis; frondis fertilis partibus omnibus minoribus, pinnis ca. 12 cm longis 8 mm latis, crenatis, venulis ubique soriferis, soris nudis confluentibus paginam inferiorem dense tegentibus.

New Guinea: Morobe, Finongan, alt. 1,400 m, *Clemens s. n.*, "in mossy mountain bush; trunk 5–6 feet."

This seems much like *C. dimorphus* (No. 6), but the description of that species is explicit, "nervis . . . infimis anastomosantibus," and "das unterste Paar anastomosierend." The sori are not merely crowded as the sporangia mature; they are somewhat indefinite, more or less elongate along the veinlets, and with border-sporangia on the "parenchyma."

64. C. TRIPHYLLUS (Sw.) Copel.

C. triphyllus (Sw.) Copel., Genera (1946) 143.
Meniscium triphyllum Swartz, Schrader's Journal (1801) 16.

Papua: *King 322; Carr 11983.*
Queensland to India.

65. C. PENTAPHYLLUS (Ros.) Copel.

C. pentaphyllus (Ros.) Copel., Genera (1946) 143.
Dryopteris pentaphylla Ros., Fedde's Repert. 12 (1913) 529.

Known only by the type collection, *Keysser 186* (1913) Hinterland des Sattelbergs, 1,400–1,500 m; isotype in Herb. Univ. Calif.

66. C. CANESCENS (Blume) Copel.

C. canescens (Blume) Copel., Genera (1946) 142.
Dryopteris canescens var. *novo-guineenssis* Brause, Engler's Jahrb. **49** (1912) 22.

Brass 12210, alt. 1,750 m. "Bank of a forest stream; common on rocks and on ground." The varietal type is *Schlechter 18844,* Bismarck Mountains; isotype in Herb. Univ. Calif.

The variety is endemic, and would better be regarded as a species, as I have treated nearly related Philippine members of the group. It is distinguished from the supposedly typical *C. canescens* by some degree of dimorphism and by having only the lowest veinlets anastomosing.

67. C. LANCEOLUS (Christ) Copel.

C. lanceolus (Christ) Copel., Genera (1946) 142.
Dryopteris lanceola (Christ) Copel., Philip. Jour. Sci. **56** (1935) 102.

Keysser II 85 (1912), Bolan, alt. 2,400–3,000 m, received as *D. canescens* var. *nephrodiiformis* Christ; fertile frond only, exactly like Philippine fertile fronds.

Philippines.

68. C. BECCARIANUS (Ces.) Copel.

C. beccarianus (Ces.) Copel., Genera (1946) 142.
Meniscium beccarianum Cesati, Rend. Ac. Napoli **16** (1877) 27.
Dryopteris cesatiana C. Chr., Index (1905) 257.
D. oblanceolata Copel., Philip. Jour. Sci. **9** C (1914) 3.
D. canescens var. *incana* Ros., in herb.

Brass 12199, 13050, alt. 1,750 and 850 m.

Throughout New Guinea, evidently common.

Fiji.

SPECIES NOT PLACED:

Dryopteris mamberamensis v.A.v.R., Bull. J. B. Buitenzorg II No. 24 (1917) 3.

26. AMPELOPTERIS Kunze

A. PROLIFERA (Retz.) Copel.

A. prolifera (Retz.) Copel., Genera (1946) 144.
Hemionitis prolifera Retz., Obs. VI (1791) 38.
Dryopteris prolifera C. Chr., Index 286, and other recent writers.

Brass 8875, 13936, swampy places near sea level; *Lam 1105, 1141,* same region and habitat; *King 128, Carr 12285,* Papua.

Polynesia to Africa.

27. SPHAEROSTEPHANOS J. Smith

S. POLYCARPA (Blume) Copel.

S. polycarpa (Blume) Copel., Univ. Calif. Publ. Bot. **16** (1929) 60.

King 159, 410, 413; Brass 544, all from Papua; *Bamler, Rosenstock Fil. novog. exsicc. n. 81,* Logaueng, alt. 300 m. Larger than known elsewhere, but not otherwise distinguishable.

Malaya. The generic range includes the Solomon Islands.

27A. CYSTOPTERIS Bernhardi

C. TENUISECTA (Blume) Mett.

C. tenuisecta (Blume) Mett.

Ledermann 858 is reported as this species, but it is misplaced in *Cystopteris.*

To Formosa and India.

28. ATHYRIUM Roth

Key to the species

Veins free.
- Frond tripinnatifid or more dissected.
  - Small ferns, mostly under 20 cm tall.
    - Paleae and lamina brownish ..... 1. *A. minutum*
    - Entire plant blackish ..... 15. *A. squamuligerum*
  - Size moderate,—up to 60 cm tall.
    - Axes light-brown.
      - Pinnae obtuse to acute ..... 2. *A. setiferum*
      - Pinnae acuminate ..... 3. *A. Myer-Dreesii*
    - Axes dark-brown ..... 4. *A. scotinum*
  - Large ferns.
    - Fully tripinnate.
      - Secondary pinnules incised.
        - Sori elongate ..... 7. *A. Huttoni*
        - Sori short, basal ..... 9. *A. decompositum*
      - Secondary pinnules entire.
        - Rachises furfuraceous ..... 8. *A. latilobum*
        - Rachises naked except at nodes ..... 6. *A. pedicellatum*
    - Tripinnatifid.
      - Sori short.
        - Segments 4 mm wide ..... 10. *A. woodwardioides*
        - Segments 2–3 mm wide ..... 11. *A. sylvaticum*
      - Sori elongate.
        - Indusium lacerate.
          - Veins nearly all simple ..... 12. *A. Blumei*
          - (Forked veins not rare)
          - Forked veins not rare.
            - Pinnules 25 mm wide ..... 13. *D.* Nymani*
            - Pinnules 15 mm wide ..... 14. *D. Schraderi*
        - Indusium entire.
          - Segments 12 by 3.6 mm ..... 15. *D. Schlechteri*
          - Segments 10 by 5 mm ..... 16. *D. Schultzei*
- Frond bipinnate, not nearly tripinnate.
  - Lamina thin.
    - Sori short ..... 2. *A. setiferum*

* This key "D" stands for *Diplasium.*

Sori elongate ..... 5. *A. morobense*
Lamina firm.
Small fern, mostly under 20 cm tall..... 17. *A. squamuligerum*
Much larger.
Pinnules cut two-thirds to costa..... 18. *D. opacifolium*
Pinnules cut one-third or one-half to costa.
Pinnules up to 6 cm long.
Lamina over 50 cm long..... 19. *A. nitens*
Lamina under 30 cm long..... 5. *A. morobense*
Pinnules commonly 12 cm long..... 20. *A. davaoense*
Pinnules more shallowly toothed.
Pinnules over 10 cm long..... 21. *A. maximum*
Pinnules 3–5 cm long..... 22. *A. cyatheifolium*
Pinnae pinnate at base, elsewhere subpinnate.
Paleae of stipe elongate, short-ciliate..... 23. *A. uncidens*
Most paleae reduced to tufts of hairs..... 24. *A. Keysseri*
Pinnae deeply pinnatifid.
Stellate paleae present.
Indusium linear ..... 25. *A. protensum*
Indusium wanting ..... 26. *D. asterothrix*
Stellate paleae absent.
Stipe and rachis dark.
Pinnae about 2.5 cm wide..... 27. *A. sorsogonense*
Pinnae 6 cm wide..... 28. *A. Archboldii*
Axes stramineous or greenish..... 29. *A. japonicum*
Pinnae icised or lobed.
Pinnae subcordate.
Lacerate squamules present ..... 30. *A. Weinlandii*
Lacerate squamules wanting ..... 31. *A. serrato-crenatum*
Pinnae truncate or cuneate at base.
Sori elongate ..... 32. *A. bulbiferum*
Sori horse-shoe-shaped ..... 33. *A. Ledermanni*
Pinnae serrate ..... 34. *A. pallidum*
Pinnae crenate-sinuate or entire.
Pinnae about 1 cm wide.
Stipe and rachis stramineous..... 35. *A. flaviviride*
Stipe and rachis black, scaly..... 36. *A. acrocarpum*
Pinnae much wider ..... 39. *A. fraxinifolium*
Veins anastomosing.
Frond bipinnate ..... 37. *A. esculentum*
Frond pinnate or simple.
Base of pinnae cuneate.
Axes brown, naked ..... 38. *A. fraxinifolium*
Axes black, scaly ..... 39. *A. Cumingii*
Frond usually simple, base cordate..... 40. *A. cordifolium*

1. A. MINUTUM Copel. Plate 39.

A. minutum Copel., Univ. Calif. Publ. Bot. 18 (1942) 221.

A. nanum, rhizomate brevi-repente, paleis linearibus 5 mm longis integris olivaceo-ferrugineis vestito; stipitibus fascicu-

latis, gracilimis, ca. 5 cm longis, fuscis, parce et decidue squamulatis; lamina 3–5 cm longa, basi 2.5 cm lata, subacuta, tripinnatifida; rhachi filiforme, superne angustissime alata, parce decidue strigillosa; pinnis ca. 8-paribus, inferioribus stipitulatis, apice rotundatis, infimis maximis 8 mm latis, herbaceis, glabris; pinnulis usque ad 4-paribus, infimis pedicellatis, truncato-orbicularibus, profunde incisis segmentis 2–4, segmentis majoribus et pinnulis minoribus apice pauci-dentatis; soris ad pinnulas vel segmenta semper basalibus, saepe solitariis, brevibus, indusio lato, stramineo, integro vel eroso, persistente.

Dutch New Guinea: Northern slope of Mt. Wilhelmina, alt. 3,950 m, *Brass* et *Myer-Drees 10107,* in a rock-hole on grassland; *No. 10340,* alt. 3,800 m, among mosses in wet limestone cave.

A relative of *A. setiferum,* distinguished by non-acuminate frond, ovate pinnae, dissected pinnules, and position of sori.

2. **A. SETIFERUM** C. Chr.

A. setiferum C. Chr., Index (1905) 146; Brittonia 2 (1937) 293.

Brass et *Myer-Drees 9857,* Mt. Wilhelmina, alt. 3,560 m, in tufts in ground moss in subalpine forest; *Brass 4392, 4481,* Mt. Albert Edward, alt. 3,680 m,—see Brittonia, 1. c.

Himalayas. Represented in Borneo by *A. atropurpureum* Copel.; in Luzon and Formosa, by *A. Oreopteris* Copel.

3. **A. MYER-DREESII** Copel.

A. Myer-Dreesii Copel., Univ. Calif. Publ. Bot. 18 (1942) 222.

A. rhizomate erecto, paleis ferrugineis fuscescentibus integris anguste lanceolatis attenuatis 7 mm longis vestito; stipitibus fasciculatis, 30 cm altis, gracilibus, stramineis brunnescentibus, deorsum sparse paleatis sursum nudis; lamina 20 cm longa 10 cm lata, subtripinnata, apice valde attenuata, glabra, papyracea (sicca); pinnis infimis 8.5 cm longis 15 mm latis, sensim acuminatis, pedicellis 3 mm longis; pinnulis majoribus brevipedicellatis, rhomboideis, 10 mm longis 5 mm latis, apice rotundatis, subpinnatis segmentis 0.6–1.2 mm latis apice 1–3-dentatis; pinnis sequentibus gradatim minoribus; soris ad segmenta plerisque basalibus; indusiis latis, plerisque rectis, brunneis, integris vel eroso-crenatis.

Dutch New Guinea: 7 km N.E. of Wilhelmina-top, alt. 2,560 m, *Brass* et *Myer-Drees 9851,* in ground moss of subalpine forest. Type in Gray Herbarium.

One of the group of *A. nigripes,* more immediately related to *A. setiferum.*

4. A. SCOTINUM (Ros.) Copel., comb. nov.

Diplazium scotinum Ros. Fedde's Repert. **12** (1913) 169.

The type is *Kyesser B* (or *II*) *44*, Mt. Bolan, alt. 3,400–3,800 m; isotype in Herb. Univ. Calif. Rosenstock, 1. c., distinguished also vars. *platyloba, Keysser B 61* (not seen), and *microloba, Keysser B 41*, collected at the same place; the latter needs no distinguishing name. There is also var. *contracta* Hieron., Engler's Jahrb. **56** (1920) 143.

Endemic.

5. A. MOROBENSE Copel., sp. nov. **Plate 40.**

A. rhizomate adscendente, 3 mm crasso, paleis atris lanceolatis 3 mm longis vestito; stipitibus congestis, basin versus nigris paleatis, sursum rhachibusque atroviridibus glabris; lamina 20–25 cm longa, 12 cm lata, bipinnata, acuminata; pinnis erecto-patentibus, pedicellatis, basi conspicue obliquis, acutis; pinnulis infimis acroscopicis maximis 15 mm longis, 7 mm latis, obliquis, latere acroscopico incisis lobis paucis, alibi cum pinnulis caeteris tantum serrulatis, papyraceis, glabris; soris majoribus 2 mm longis, plerisque unilateralibus, indusiis angustis obscuris.

New Guinea: Morobe: Boana, alt. 800–1,400 m, *Clemens 41537*, anno 1940.

This species suggests the group of *A. Williamsii*, which is better developed in the Philippines.

6. A. PEDICELLATUM Copel. **Plate 41.**

A. pedicellatum Copel., Univ. Calif. Publ. Bot. **18** (1942) 222.

A. rhizomate adscendente, 5 mm crasso, atro-fusco, apice paleis 1–2 mm longis ferrugineis vestito, glabrescente; stipite 10–15 cm alto, 1.5 mm crasso, nigrescente, glabro; lamina 25 cm longa vel majore, ovata, tripinnata (plantarum minorum laminis jam soriferis tantum tripinnatifidis), ad insertionem quamque pinnae vel pinnulae palea plerumque solitaria ornata, aliter glabra, rhachibus atroviridibus, pinnulis et pinnulis fere recte distantibus pedicellatis; pinnulis [ii] oblongis, ca. 4 mm longis et 2 mm latis, integris vel apice denticulatis, herbaceis, venulis simplicibus; soris usque ad 2 mm longis, fere omnibus unilateralibus infimis rarius diplazioideis, indusio firmo, secus venulam nigro alibi laete brunneo.

New Guinea: Morbe: Boana, alt. 800–1,400 m, *Clemens 41566;* anno 1944.

Related to *A. latilobum*, which has the same peculiar paleae at the nodes of the axes, but is distinguished by pubescent axes.

7. A. HUTTONI (Baker) Copel., comb. nov.

Asplenium Huttoni Baker, Annals of Bot. 5 (1891) 311.
Athyrium australe var. *papuanum* C. Chr., Brittonia 2 (1937) 293.
Diplazium cyatheifolium Ros. *et al.* in herb., *non* Presl.

Brass 13848, alt. 130 m; *Brass 3863*, Diene, Papua, alt. 500 m, type of var. *papuanum; Carr 14945*, Boridi, Papua, alt. 1,200 m; *Clemens* (sent as host of a fungus), Morobe; from the same region, *Schlechter 16800, Bamler 92a* and *136, Bamler, Rosenstock Fil. novog. exsicc. n. 221.* The species thus occurs at minor altitudes throughout New Guinea. It might hardly be identified as this species except by comparison with the type; I construe it by the Carr collection, received with this name from the British Museum (Mr. Alston). It was originally described from a specimen from the "Malay Isles," received by Baker from Messrs. Veitch.

8. A. LATILOBUM Copel. **Plate 42.**

A. latilobum Copel., Univ. Calif. Publ. Bot. 18 (1942) 222.

A. silvatico (Blume) Milde affine, rhizomate breve adscendente, apice paleis nigrescentibus triangulari-ovatis acutis usque ad 9 mm longis basi 3 mm latis vestito; stipitibus fasciculatis, 30–35 cm altis 4 mm crassis, deorsum sparse appresso-paleatis alibi rhachibusque minute furfuraceis nigro-fuscis; lamina 65 cm longa, 40–45 cm lata, subtripinnata, pinnis infimis paullo diminutis interdum deflexis, medialibus 20–25 cm longis, 8–10 cm latis, acuminatis, basi pedicellatis (vix 1 cm) paullo angustatis, sursum per pinnas pinnatas pinnatifidas serratas et integras ad apicem brevum acuminatum transeunte; pinnulis pinnarum medialium vix contiguis, 4–5 cm longis, ca. 16 mm latis, plerisque obtusis rarius acutis, basi truncatis pedicellatis (1.5–3 mm), deorsum pinnatis sursum profunde pinnatifidis; pinnulis [ii] sessilibus et segmentis sequentibus decurrenti-confluentibus late oblongis, 4–5 mm latis, falcato-truncatis, integris vel maximis infimis rarius late crenatis, atroviridibus, herbaceis vel siccis tenuiter papyraceis; venis in segmentis pinnatis, venula infima acroscopica solummodo plerumque furcata; soris, infimo acroscopico saepe excepto, simplicibus, 2 mm longis, indusio fusco stramineo-marginato nigrescente.

Dutch New Guinea: Idenburg River, alt. 850 m; *Brass 13420*, type, "A large clump on shady bank of stream in rain forest; stipes and rachis black." Also, *Nos. 12893*, alt. 1,100 m, and *12270*, alt. 1,700 m.

The larger pinnules of the medial pinnae have usually a single pair of sessile secondary pinnules, sometimes a pair of adnate pinnules, then about 4 pairs of similar but confluent segments. *No. 12270* is a more lax specimen, the only one with acute pinnules, and up to 7 pairs of segments and secondary pinnules.

This might be suspected of being *Diplazium opacifolium* v.A.v.R., Nova Guinea **14** (1924) 14, which I know by description only; but that species is described as less compound, with narrower pinnules, and subcoriaceous; and texture is usually a group characteristic among these ferns.

9. A. DECOMPOSITUM (Ros.) Copel. **Plate 43.**

A. decompositum (Ros.) Copel., Univ. Calif. Publ. Bot. **18** (1942) 222.

Brachysorus, stipite ultra 60 cm alto, fusco, spinuloso, sparse furfuraceo; pinna infima unica visa 32 cm longa, 20 cm lata, quadripinnatisecta, papyracea, rhachi fusca superne furfuracea aliter glabra, pedicello 15 mm longo; pinnulis imbricatis, medialibus 12 cm longis 3.5 cm latis, acuminatis, pedicellatis, recte patentibus vel recurvis, pinnulis inferioribus paullo minoribus; pinnulis secundariis approximatis, infimis sessilibus, ceteris adnatis fere omnibus ala costale confluentibus, acutis, majoribus ⅔ costam versus incisis, segmentis multis 1 mm latis falcatis acutis; venis usque ad 4-paribus; soris costularibus (ad bases venarum), brevibus, indusio fusco parvo lacero.

New Guinea: Sattelberg, alt. 800 m, *Bamler 128* (1914), type in Herb. Univ. Calif.; received from Dr. Rosenstock as "Diplazium brevisorum J. Sm var. novoguineensis Ros. n. v., = Athyrium silvaticum Bl. f. decomposita Ros. n. f., an spec. nov." This would give a correct idea of the affinity of the plant. However, the confusion is remarkable. "D. silvaticum Bl. var. novoguineensis Ros.", Hedwigia **56** (1915) 351, typified by *Bamler 56* is segregate of *D. silvaticum* (Bory) Sw., correctly placed by Hieronymus, Engler's Jahrb. **56** (1920) 134; it is No. 32 A of this enumeration.

10. A. WOODWARDIOIDES (Presl) Christ

A. woodwardioides (Presl) Christ, Verh. Nat. Ges. Basel **11** (1895) 233.

Brachysorus woodwardioides Presl. Epim. (1849) 70.

Schlechter 16613 (alt. 300 m), *19114; Bamler, Rosenstock Fil. novog. exsicc. n. 222,* as *Diplazium brevisorum* J. Sm. I have no Cuming specimen for comparison and am not quite certain of the identification, made by Hieronymus for the

Schlechter specimen. It is not in the Brause enumeration, apparently prepared, as to this genus, by Hieronymus.

Philippines.

11. A. SYLVATICUM (Blume) Milde

A. sylvaticum (Blume) Milde, Bot. Zeit. **24** (1866) 376.

Bamler 130, Sattelberg, alt. 800 m. This again bears label as var. *novoguineensis* Ros., n. v. It is quite identical with Java specimens.

Java. Further range uncertain because our specimens are poor.

12. A. BLUMEI Copel.

A. Blumei Copel., Philip. Jour. Sci. **3** C (1908) 294.
Diplazium polypodioides Blume, Enum. (1828) 194.
Athyrium fimbristegium Copel., Philip. Jour. Sci. **9** C (1914) 5.

King 386 (type of *A. fimbristegium*), *459,* Papua; *Keysser 44; Zahn s. n.,* Sattelberg. Hieronymus omits this species from Brause's enumeration, but describes 5 new species, "Subspecies D. polypodioidis" or "e turma D. polypodioidis." I have no authentic specimens of any of them, and can list them only for what they may be worth. Of these great ferns, such criteria as size of pinnule always vary from part to part of a single frond, and the forking of the veins varies with the size of the segment. The indusium of specimens I recognize as *A. Blumei* is fimbriate in Java and in New Guinea; it is entire on specimens so named from Indo-China and Assam.

13. DIPLAZIUM NYMANI Hieron.

Diplazium Nymani Hieron., Engler's Jahrb. **56** (1920) 136.

The type is *Nyman 698,* Sattelberg, alt. 900 m. *Carr 15712,* from Papua, comes with this name from the British Museum, and fits the description.

14. DIPLAZIUM SCHRADERI Hieron.

Diplazium Schraderi Hieron., Engler's Jahrb. **56** (1920) 141.

The type is *Ledermann 12076,* Schraderberg, alt. 2,070 m.

15. DIPLAZIUM SCHLECHTERI Hieron.

Diplazium Schlechteri Hieron., Engler's Jahrb. **56** (1920) 138.

The cited specimens are *Ledermann 11032, 11867, 11942; Nyman 432; Schlechter 14339; Hellwig 609, 613, 617,* all from Kaiser-Wilhelmsland, alt. 900–2,070 m.

16. DIPLAZIUM SCHULTZEI Hieron.

Diplazium Schultzei Hieron., Engler's Jahrb. **56** (1920 140.

Schultze 260; Ledermann 12882; Warburg s. n. Brass 5165, Mafulu, Papua, alt. 1,250 m is identified as this species by Christensen; it does not fit the description, but may have been named by comparison with an authentic specimen.

16A. DIPLAZIUM NAUMANNI Hieron.

Diplazium Naumanni Hieron., Engler's Jahrb. **56** (1920) 137.

Described from a collection by the Gazelle Expedition at Mac Cluer Bay.

Diplazium prolongatum Ros., Meded. Rijks Herb. No. 31 (1917) 5.

"A praecedente recedit pinnis secundariis haud acuminatis, segmentis s. pinnis tertiariis margine serratis, non rotundato-crenatis." The preceding species is *D. pseudocyatheifolium,* which has not acuminate pinnules, nor any secondary segments or pinnules, and is nowhere round-crenate. Comparison with something else may have been intended, but, as published, *D. prolongatum* is essentially a *nomen nudum.*

Diplazium asperum var. *subpolypodioides* v.A.v.R. [*D. subpolypodioides* v.A.v.R., Bull. Jardin Buit. No. XX (1915) 11] is listed by Hieronymus, p. 136, but I find no explicit authority for its occurrence elsewhere than in Sumatra.

17. A. SQUAMULIGERUM (Ros.: Hieron.) Copel.

A. squamuligerum (Ros.: Hieron.) Copel., Jour. Arnold Arb. **10** (1929) 178.

Asplenium varians var. *squamuligera* Ros., Fedde's Repert. **12** (1913) 528.

Asplenium squamuligerum Hieron., Hedwigia **61** (1919) 5; Engler's Jahrb. **56** (1920) 147.

Athyrium Ramosii Copel., Philip. Jour. Sci. **38** (1929) 140.

A. geophilum var. C. Chr., Suppl. III (1934) 41 (overlooking p. 38).

The assignment of this plant to a genus has made more than enough trouble. The latest instance is by Christensen, Brittonia **2** (1937) 293, "The referring of *Asplenium squamuligerum* Hieron. to *Athyrium* by Copeland is very problematical." This does not appear in Suppl. III p. 41, under *A. geophilum,* and my type sheet of *A. Ramosii* is annotated by Christensen as "certainly an Athyrium." Still, its relatives are plants which he still prefers to call *Diplazium.* With the fine new New Guinea material in hand, I must conclude that *A. Ramosii* is the same species. *A. geophilum,* however, is distinct, being without the characteristic paleae on the axes.

Keysser 228, Sattelberg Hinterland, alt. 1,400–1,500 m, type; *Brass 12209, 12832, 13635,* alt. 850–1,750 m, Idenburg River; *Clemens,* Morobe, alt. 900 m.

Mindanao.

18. DIPLAZIUM OPACIFOLIUM v.A.v.R.

Diplazium opacifolium v.A.v.R., Nova Guinea **14** (1924) 14.

Lam 1048, Mamberamo River, alt. 90 m; not seen.

A collection by Zahn, Sattelberg, alt. 900 m, received with a manuscript name by Christ, fits the description of *D. opacifolium* in most respects, but the largest pinnules of the complete frond are less than 2 cm long by 8 mm wide. If it were a Philippine specimen, it might be *A. atratum.*

19. A. NITENS (Ros.) Copel., comb. nov.

Diplazium nitens Ros., Fedde's Repert. **5** (1908) 373.

Werner 62, Danum, alt. 500 m; isotype in Herb. Univ. Calif.; *Bamler, Rosenstock Fil. novog. exsicc. n. 161,* Logaueng, alt. 400 m; *Schlechter 17647,* Kani Mountains, alt. 600 m.

Endemic.

20. A. DAVAOENSE Copel.

A. davaoense Copel., Philip. Jour. Sci. **3** C (1908) 295.

Bamler, Rosenstock Fil. novog. exsicc. n. 189, Sattelberg, alt. 800 m; *Carr 13018, 14471,* Boridi, Papua, alt. 1,400 m; all received as *Diplazium cyclolobum* (Christ) Ros., a name which I have not located.

Philippines.

21. A. MAXIMUM (Don) Copel.

A. maximum (Don) Copel., Philip. Jour. Sci. **3** C (1908) 295.

Both *Diplazium maximum* (Don) C. Chr. and *D. latifolium* Moore have been reported from New Guinea. I have no local specimen, and, as both names have been used for groups of species, do not know at all exactly what were (or is) meant.

22. A. CYATHEIFOLIUM (Rich.) Milde

A. cyatheifolium (Rich.) Milde, Bot. Zeit. **28** (1870) 353.

King 331; Brass 603, 3805; Papua.

Endemic, so far as definitely known.

23. A. UNCIDENS (Ros.) Copel.

A. uncidens (Ros.) Copel., Univ. Calif. Publ. Bot. **12** (1931) 394.
Dryopteris uncidens Ros., Fedde's Repert. **10** (1912) 337.

Brass 12894, alt. 1,100 m; *Frau Bamler 3,* Sattelberg, isotype in Herb. Univ. Calif.; *Keysser 179p,* ibid., alt. 1,400–1,500 m; *Clemens,* Morobe District. Exindusiate.

Endemic.

24. A. KEYSSERI Copel., nom. nov.

Diplazium atropurpureum Ros., Fedde's Repert. **12** (1913) 528, *non Athyrium atropurpureum* Copel.

Keysser 179, Sattelberg Hinterland, alt. 1,450 m; isotype in Herb. Univ. Calif.; *Brass 5044,* Mt. Tafa, Papua, alt. 2,400 m.

Endemic.

25. A. PROTENSUM (Ros.) Copel., comb. nov.

Diplazium protensum Ros., Fedde's Repert. **12** (1913) 169.

Keysser 106, 108 (as published), Sattelberg, alt. 800–1,000 m; not certainly seen; but we have, from Dr. Rosenstock, *Keysser II 118,* slightly smaller but otherwise as described, probably different in number because of error. Most sori are exindusiate, but a few narrow indusia can be detected. Like the preceding species in its paleae and prior in name, but apparently distinct in other respects.

26. DIPLAZIUM ASTEROTHRIX C. Chr.

Diplazium asterothrix C. Chr., Britonnia **2** (1937) 292.

Brass 3848, Dieni, Central Division, Papua, alt. 500 m. *Schlechter 16853,* received as *Dryopteris africana,* is probably an ill developed form of the same species.

This is like the two preceding species in its stellate paleae, and like *A. uncidens* in being exindusiate. I suspect that it is more perfectly developed specimen of *A. protensum.*

27. A. SORSOGONENSE (Presl) Milde

A. sorsogonense (Presl) Milde, Bot. Zeit **28** (1870) 354.

Brass 8945, Cyclops Mountains, alt. 500 m; *13655,* Idenburg River, alt. 700 m; *King 329; Carr 12071, 12545,* Papua.

I have not seen *Diplazium mamberamense* v.A.v.R., Suppl. Corections (1917) 55, but suspect it to be an ill developed *A. sorsogonense,* distinguished by pinnae cut only half-way to the costae.

To India; but slightly different beyond the Malay Peninsula.

28. A. ARCHBOLDII Copel. **Plate 44.**

A. Archboldii Copel., Univ. Calif. Publ. Bot. **18** (1942) 222.

A. rhizomate adscendente, paleis brunneis anguste lanceolatis 17 mm longis primo integris tum demum margine fibrilloso-

deliquescente vestito; stipite 40 cm alto, sicco 4 mm crasso, superne trisulcato fusco, rhachique paleis nigris rigidis recurvis angustis 1–2 mm longis ornatis; lamina 75 cm longa, bipinnatifida; pinnis infimis 11 cm longis, 5 cm latis; medialibus 18 cm longis, 6 cm latis, acuminatis, basi truncatis vel abrupte paullo angustatis, breviter (1 mm) pedicellatis, deorsum ⅔ ad costam pinnatifidis, apices versus tantum serratis, subcoriaceis, segmentis serrulatis acutis; pinnis superioribus etiam 15 cm longis ca. 3 cm latis vix ½ ad costam incisis lobis rotundatis; apice frondis pinnis coadunatis composito ca. 15 cm longo; venis plerisque furcatis; soris segmentorum majorum usque ad 10-paribus, ca. 6 mm longis, margine remotis, infimis diplazioideis, indusio fusco angusto integro.

Dutch New Guinea: 15 km S.W. of Bernhard Camp, Idenburg River, alt. 1,700 m, *Brass 12272;* "Common ground fern in a rain forest; leaves somewhat fleshy."

The upper part of the frond suggests *A. maximum,* but the lower part is utterly different. It is probably a relative of *Diplazium pseudoshepherdioides,* but the lower and medial pinnae are twice as broad, and very short-stalked; by description, that species seems much like *A. polycarpum* Copel., of Borneo.

29. A. JAPONICUM (Thunb.) Copel.

A. japonicum (Thunb.) Copel., Philip. Jour. Sci. 3 C (1908) 290.

Brass 9303, Lake Habbema, alt. 3,225 m, very large; *Clemens* Morobe, host of a fungus *No. 6735,* not quite identical.

New Zealand (native?) to Japan and India.

30. A. WEINLANDII (Christ) Copel., comb. nov.

Diplazium Weinlandii Christ, Bull. Boiss. II 1 (1901) 452.
D. bamlerianum Ros., Fedde's Repert. 10 (1912) 329.

Bamler (No. 40), Rosenstock Fil. novog. exsicc. n. 220, Sattelberg, alt. 600 m, isotype in Herb. Univ. Calif.

Endemic.

31. A. CRENATO-SERRATUM (Blume) Milde

A. crenatum-serratum, (Blume) Milde, Bot. Zeit. 28 (1870) 353.

King 344, 446.

Malaya; Philippines.

32. A. BULBIFERUM (Brack.) Copel.

A. bulbiferum (Brack.) Copel., Bishop Museum Bull. No. 59 (1929) 53.

Brass 8826, Hollandia, alt. 50 m. Common and variable. Most New Guinea specimens are notably large.

Fiji to Mauritius.

32A. DIPLAZIUM NOVOGUINEENSE (Ros.) Hieron.

Diplazium novoguineense (Ros.) Hieron., Engler's Jahrb. **56** (1920) 134.

Bamler 56 bis, Sattelberg, alt. 600 m, isotype in Herb. Univ. Calif., reissued as *Rosenstock Fil. novog. exsicc. n. 219.* This is the most over-grown development of *A. bulbiferum,* the pinnae up to 25 cm long and 4.5 cm wide, and very shallowly cut. It looks distinct enough for specific recognition, but probably intergrades with plants of more normal size.

Local.

33. A. LEDERMANNI Hieron.

A. Ledermanni Hieron., Engler's Jahrb. **56** (1920) 133.

Ledermann 11906, alt. 2,070 m. Not seen.

34. A. PALLIDUM (Blume) Milde

A. pallidum (Blume) Milde, Bot. Zeit. (1870) 354.

King 365, Papua; *Bamler, Rosenstock Fil. novog. exsicc. n. 187,* Wareo, alt. 600 m.

Malaya; Philippines; Queensland; New Hebrides.

35. A. FLAVOVIRIDE Alston

A. flavoviride Alston, Jour. Bot. **78** (1940) 226.

Clemens 7037, Sambanga, Morobe, alt. 5,000–6,000 feet. Not seen.

36. A. ACROCARPUM (Ros.) Copel., comb. nov.

Diplazium acrocarpum Ros., Fedde's Repert. **10** (1912) 328.
Asplenium acrocarpum Hieron., Hedwigia **61** (1919) 32; Engler's Jahrb. **56** (1920) 148.

Brass 12036, alt. 1,750 m, common ground fern in rain forest. Described from the Sattelberg, *Keysser 27,* isotype in Herb. Univ. Calif.; reported also as *Ledermann 11853.*

Endemic.

Report of *A. Merrillii* in New Guinea may be due to confusion with this species. The Philippine *A. longissimum* Copel. has far more numerous, smaller pinnae. The Bornean *A. fuliginosum* has a long pinnatifid apex. These are all nearly related, and with several relatives pinnatifid throughout, might constitute a small segregate genus.

37. A. ESCULENTUM (Retz.) Copel.

A. esculentum (Retz.) Copel., Philip. Jour. Sci. **3** C (1908) 295.

Brass 13646, alt. 850 m. Common at minor altitudes throughout New Guinea, always with only the lower veinlets anastomosing. This form has been named *Asplenium vitiense* Baker and *A. dietrichianum* Luerssen, thus occupying the eastern end of the range of the species in which it is here included. The typical form, with half or more of the veinlets anastomosing, is found in Hawaii, but is probably not native there.

To India.

38. A. FRAXINIFOLIUM (Presl) Milde

A. fraxinifolium (Presl) Milde, Bot. Zeit. 28 (1870) 353.

Brass 13881, alt. 120 m; *Bamler 30,* Logaueng; *King 377, 414,* Papua. *Schlechter 17793* bears this name, but is distinct. Also reported from New Guinea as *Diplazium bantamense.* Report of *D. alternifolium* may be based on this or the following species.

To India and Formosa.

39. A. CUMINGII (Presl) Milde

A. Cumingii (Presl) Milde, Bot. Zeit. 28 (1870) 353.

Brass 12274, alt. 1,750 m; *Bamler 121,* Wareo, distributed as *A. fraxinifolium; Brass 5444,* Papua, alt., 1,450 m. New Guinea specimens are less scaly than the Philippine type, but clearly nearer to it than to *A. fraxinifolium.*

Philippines; Celebes.

40. A. CORDIFOLIUM (Blume) Copel.

A. cordifolium (Blume) Copel., Philip. Jour. Sci. 3 C (1908) 300.

Brass 12250, 13418, 13740, alt. 570–1,750 m. Common.

To the Malay Peninsula.

29. DIPLAZIOPSIS Christensen

D. JAVANICA (Blume) C. Chr.

D. javanica (Blume) C. Chr., Index (1905) 227.

Brass 12939, alt. 1,200 m.

Samoa to Formosa and India.

30. CALLIPTERIS Bory

Key to the species

Frond simply pinnate ..... 1. *C. prolifera*
Frond bipinnate ..... 2. *C. spinulosa*

1. C. PROLIFERA (Lam.) Bory

C. prolifera (Lam.) Bory, Voy. I (1804) 283.
Athyrium accedens (Blume) Milde, Bot. Zeit. 28 (1870) 353.

Brass 13799, alt. 160 m; probably common, certainly conspicuous, at minor altitudes throughout New Guinea.

Fiji to Africa.

2. **C. SPINULOSA (Blume) J. Smith**

C. spinulosa (Blume) J. Smith, Jour. Bot. **3** (1841) 409.
Diplazium spinulosum Blume, Enum. (1828) 193.
Diplazium paradoxum Fée, Genera (1850–1852) 214.
Asplenium smithianum Baker, Syn. Fil. (1867) 245; Christ, Ann. Jar. Buit. **15** (1904) 122.

Bamler 66, Sattelberg, alt. 800 m; *Carr 14526, 15688*, Papua. Rosenstock, Hedwigia **56** (1915) 351, distinguished two varieties or forms by name, and entered a third name on one of our labels; all may apply to parts of a single frond.

The apparent distribution of this species, unknown between Celebes and Ceylon, is remarkable.

ILLUSTRATIONS

[Photographs of types, except Plates 6 and 29, which are photographs of fragments of types.]

PLATE 1. Polystichum Archboldii Copel.
2. P. Brasii Copel.
3. P. muticum Copel.
4. P. Myer-Dreesii Copel.
5. P. cheilanthoides Copel.
6a. Lomagramma angustipinna Copel.
6b. Cyclosorus adenostegius Copel.
7. Elaphoglossum habbemense Copel.
8. E. Archboldii Copel.
9. E. laticuneatum Copel.
10. E. brunneum Copel.
11. E. repens Copel.
12. E. fuscum Copel.
13. Ctenitis speciossima Copel.
14. C. pulchra Copel.
15. C. habbemensis Copel.
16. Tectaria pubescens Copel.
17. Lastrea platyptera Copel.
18. L. petrophila Copel.
19. L. Regis Copel.
20. L. subdimorpha Copel.
21. L. belensis Copel.
22. L. ophiura Copel.
23. L. crassa Copel.
24. L. wantotensis Copel.
25. L. armata Copel.
26. Cyclosorus distinctus Copel.
27. C. vestigiatus Copel.
28. C. paripinnatus Copel.
29. C. deltipterus Copel.
30. C. subappendiculatus Copel.
31. C. gregarius Copel.
32. C. multiauriculatus Copel.
33. C. protectus Copel.
34. C. terrestris Copel.
35. C. albosetosus Copel.
36. C. strigosissimus Copel.
37. C. riparius Copel.
38. C. morobensis Copel.
39. Athyrium minutum Copel.
40. A. morobense Copel.
41. A. pedicellatum Copel.
42. A. latilobum Copel.
43. A. decompositum Copel.
44. A. Archboldii Copel.

PLATE 1.

PLATE 2.

PLATE 3.

PLATE 4.

PLATE 5.

PLATE 6 A & B.

MILLIMETERS
TYPE
Herbarium of the Arnold
In a cushion of hepatics on exposed branch
of tree.
Botanical collections of the Third New Guinea Expedition, American Museum

PLATE 7.

PLATE 8.

TYPE
Plants of Dutch New Guinea
Herbarium of the Arnold Arboretum,
Harvard University
No. L. J. Brass & E. Myer-Drees Sept. 1938
MILLIMETER
Mt. Wilhelmina
Botanical collections of the third New Guinea Expedition, American Museum
of Natural History, Mr. Richard Archbold, Leader.

PLATE 9.

MILLIMETER
TYPE
L J Brass
Feb. 1939
Plants of Dutch New Guinea
Collected by the Archbold New Guinea Expedition

PLATE 10.

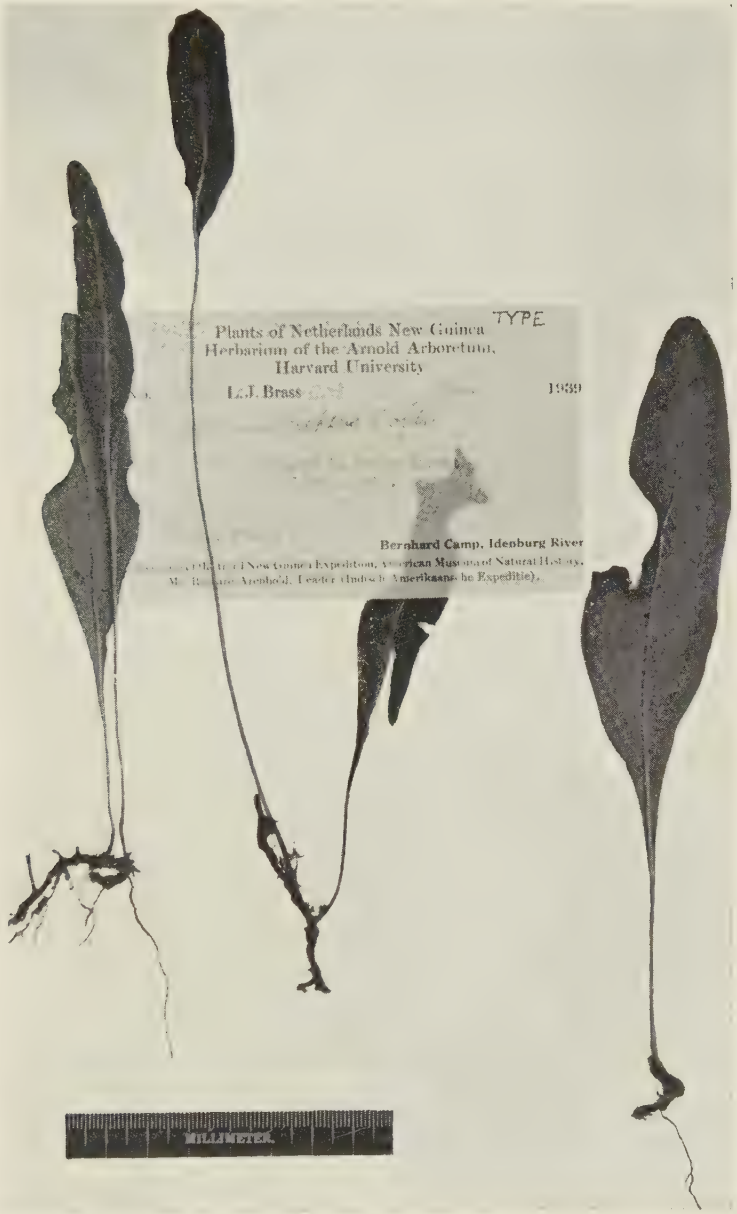
TYPE
Plants of Netherlands New Guinea
Herbarium of the Arnold Arboretum,
Harvard University
L.J. Brass
1939
Bernhard Camp, Idenburg River
MILLIMETER

PLATE 11.

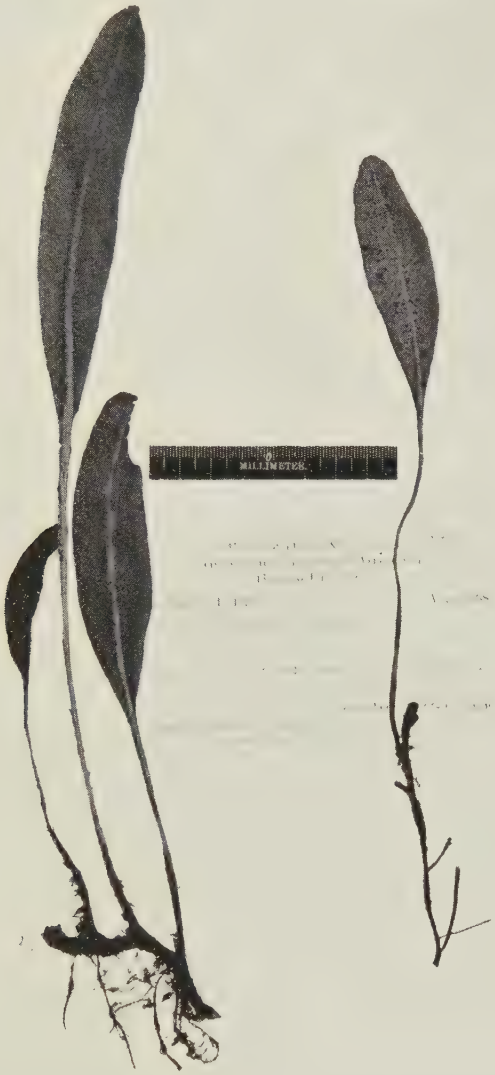

PLATE 12.

PLATE 13.

PLATE 14.

PLATE 15.

PLATE 16.

E. B. Copeland
TYPE
Plants of Dutch New Guinea
Herbarium of the Arnold Arboretum
Harvard University
MILLIMETER

PLATE 17.

PLATE 18.

PLATE 19.

PLATE 20.

PLATE 21.

PLATE 22.

PLATE 23.

PLATE 24.

PLATE 25

PLATE 26.

Plants of Netherlands New Guinea TYPE
Herbarium of the Arnold Arboretum,
Harvard University
No. 12317 L.J. Brass 1939
Dryopteris vestigiata Copel.

PLATE 27.

PLATE 28.

TYPE fragment

PLATE 29.

PLATE 30.

PLATE 31.

PLATE 32.

PLATE 33.

PLATE 34.

PLATE 35.

PLATE 36.

PLATE 37.

PLATE 38.

Athyrium minutum Copel.
Dutch American Expedition
Plants of Dutch New Guinea TYPE
Herbarium of the Arnold Arboretum,
Harvard University
No. 10137 L. J. Brass & E. Myer-Drees Sept. 1938
Asplenium minutum Copel.
In a rock-hole on grassland.
350 m. alt.
Northern slopes of Mt. Wilhelmina
Botanical collections of the third New Guinea Expedition, American Museum
of Natural History, Mr. [illegible] Archbold, Leader.

PLATE 39.

PLATE 40.

PLATE 41.

PLATE 42.

PLATE 43.

Plants of Netherlands New Guinea TYPE
Herbarium of the Arnold Arboretum,
Harvard University
No. L.J. Brass 1939
Bernhard Camp., Idenburg River
DECIMETER

PLATE 44.

ERRATA

VOLUME 78

Page 97, line 6 for Zonker, should read Zenker.

Page 97, lines 6 and 11, for Beuin, should read Bouin.

Page 151, line 20, for E., should read F.

Page 151, line 23, for EE., should read FF.

Page 208, line 31, for *A. gracile* Fée, should read 19. *A. Clemensiae.*

Page 209, line 3 from bottom, H. Nepah., should read Fl. Nepal

Page 211, line 14, for dent., should read deut.

Page 213, after line 19 and before 13a. *A. Regis,* insert the entire first paragraph from p. 214.

Page 217, line 7 from bottom, for *toyayanum,* should read *tavoyanum.*

Page 217, bottom line, for *Goadyi,* should read *Goadbyi.*

Page 218, lines 9 and 10, for insiticum, should read insiticium.

Page 219, line 27, should read 9,000 feet *Clemens 12384* and *bis.* The type is *Keysser II.*

Page 220, reverse lines 9 and 10 from bottom, and line 10, for Schroder's, should read Schrader's.

Page 223, line 9, for *Novoy,* should read *Novog.*

Pages 223 to 227, in the running head, for Asplemaceae, should read Aspleniaceae.

Page 224, line 15, should read Fronds bipinnatifid or bipinnate.

Page 225, in the running head, for Aspeneacea, should read Aspleniaceae.

Page 228, line 6, from bottom, for *Bamber,* should read *Bamler* (twice).

Pages 233 to 274 were missed in pagination.

Page 291, line 10, for (Hooker) [7] should read (Hooker) [8].

Page 292, line 1, for 8 to μ to 19 μ, should read 8 to 10 μ.

Page 292, line 5, for Bismarch, should read Bismarck.

Page 292, line 25, for dactic, should read lactic.

Page 293, line 7, for Pl. 1, fig. 2, should read Pl. 1, fig. 1.

Page 294, line 1, for fig. 2, should read figs. 1 and 2.

Page 294, line 3, for Pl. 1, fig. 5, should read Pl. 2, fig. 5.

Page 296, line 37, for 4 Helt, should read 4 Heft.

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[New names and new combinations are printed in *italics*.]

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